

Review of 1986 South Coast Salmon Troll Fisheries

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SALMON TROLL FISHERIES

By

T.F. Shardlow, T.G. Hoyt and A.D. Anderson

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ABSTRACT

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British Columbia troll fisheries south of Cape Caution were intensively managed for the second consecutive year in 1986. In-season management actions were designed to keep catches of each salmon species within prescribed limits while at the same time allowing each fishery to remain open for as much of the season as possible. Troll fisheries in the Strait of Georgia, on the West Coast of Vancouver Island and in Johnstone Strait were managed with combinations of partial and total area closures and periods of non-retention for certain salmon species and fisheries. Catch ceilings for chinook and sockeye were approached but not exceeded in the Strait of Georgia. For the WCVI, catch ceilings were not exceeded for chinook, were slightly exceeded for sockeye, and were exceeded by 16% for coho; the latter was due to difficulties with in-season catch monitoring. Fisheries managers expect improved troll management when precise methods for estimating in-season catches are developed.

Key words: Pacific salmon, troll fishery management, southern British Columbia.

RÉSUMÉ

Shardlow, T.F., T.G. Hoyt and A.D. Anderson. 1986. Review of 1986 South Coast salmon troll fisheries. Can. Tech. Rep. Fish. Aquat. Sci. 1560 : 97 p.

C'était la deuxième année consécutive en 1986 qu'on faisait une gestion intensive des pêches à la traîne au sud du cap Caution, en Colombie Britannique. Les mesures prises durant la saison avaient pour but de faire respecter les limites de prise établies tout en permettant à chaque pêches de rester ouverte le plus longtemps possible. Les mesures de gestions prises pour les pêches à la traîne dans le détroit de Georgie, sur la côte ouest de l'île Vancouver et dans le détroit de Johnstone ont inclus la fermeture partielle ou totale de certains secteurs et des périodes de rejet obligatoire pour certaines espèces de saumon et dans certaines pêches. Les prises de saumon quinnat et de saumon nerka ont presque atteint les limites mais ne les ont pas dépassées sur la côte ouest de l'île Vancouver et dans le détroit de Georgie. Par contre, la limite de prise pour le saumon coho a été dépassée sur la côte ouest de l'île Vancouver parce qu'il était difficile de surveiller la prise durant la saison. Les gestionnaires des pêches pensent qu'ils pourront faire une meilleure gestion des pêches à la traîne lorsqu'ils disposeront de méthodes précises pour estimer les prises durant la saison.

Mots clés: saumon du Pacifique, gestion des pêches à la traîne, sud de la Colombie-Britannique.

1.0 INTRODUCTION

The South Coast Division began active in-season management of the troll fishery in southern British Columbia for the first time in 1985 (Shardlow et al. 1986). Previously, the troll fishery was opened in spring and closed in fall with occasional minor adjustments to fishing times and areas through the course of the season (Argue et al. 1983, 1987; Milne 1964). The year 1986 was the second year of active fishery management.

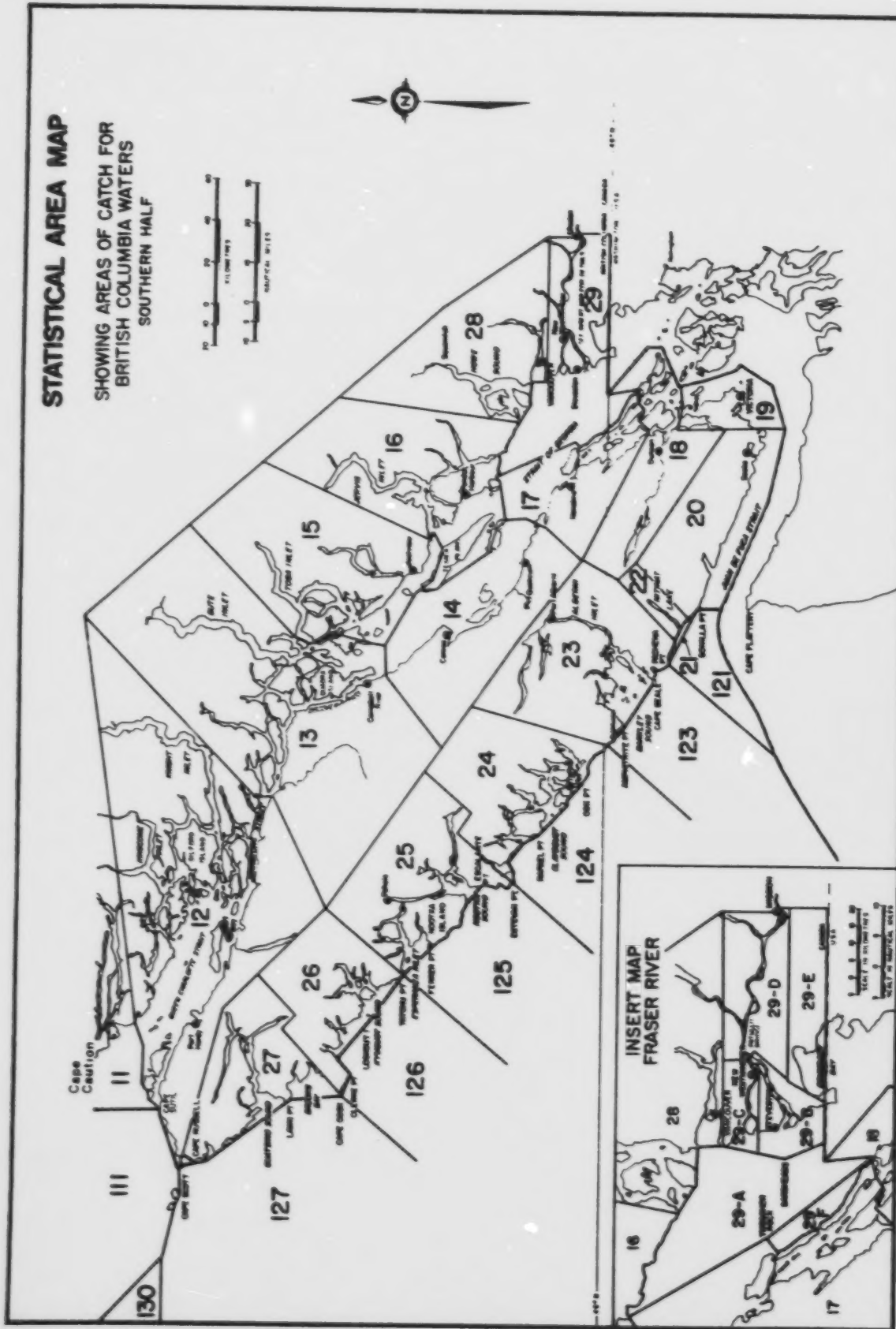
The active in-season management was primarily due to continuation of salmon catch ceilings on the troll fishery (Table 1, Appendix 1). Catch ceilings for chinook and coho salmon were a requirement of the Pacific Salmon Treaty. Catch ceilings for Fraser River stocks of sockeye, primarily Adams stock, were developed through the Minister's Advisory Council (MAC) once the Pacific Salmon Commission (PSC) had provided estimates of total allowable catch for Canada. These fixed upper limits to the seasonal catch meant that in-season regulation of the troll fishery was required.

Detailed fishing plans were necessary so that all concerned with the fisheries were informed of possible in-season regulations. Co-management committees consisting of fishermen, industry representatives and Department of Fisheries and Oceans (DFO) personnel developed the initial fishing plans. The DFO adopted most of the initial plans for the West Coast of Vancouver Island and for the Strait of Georgia, but, as salmon runs developed during the season, major revisions were required to the original plans.

This report documents the 1986 troll fishing plans for southern British Columbia (waters south of Cape Caution, Fig. 1), in-season management actions and resultant catches in pieces for three troll fisheries: Strait of Georgia (historically known as Gulf of Georgia, Statistical Areas 13-18, 29), West Coast of Vancouver Island (WCVI, Areas 21-27, 121-127, 130-1 and 111) and Johnstone Strait (Areas 11-12 and also parts of Areas 111 and 13 depending on salmon species and type of fisheries in question). Statistical Areas for southern British Columbia are shown in Figure 1.

1.1 REPORTING CATCHES

Reporting catches in this report was difficult since three sets of catch figures had to be considered. First in-season catches as provided by the In-season Catch Monitoring Program (ICMP) (Webb et al. 1983) are those catches on which management decisions are made during the season. These catch figures are provided each week during the fishery, and they are continually updated through the course of the season until a final ICMP estimate is made shortly after all trolling closes. This final estimate is referred to in this report as the post-season estimate. The post-season estimate is often the best estimate until the third estimate, referred to as the sales slip estimate, becomes available. In this report, the sales slip estimate is the catch as provided by sales slips received up to April 2, 1987 for Strait of Georgia and WCVI, and up to March 20, 1987 for Johnstone Strait. The sales slip estimate will form the final official record of troll catches. However, final sales slip estimates are often unavailable until spring of the following year or later. Therefore the catches reported here are likely to increase as more slips are received. The authors believe that changes to the estimates, subsequent to the March 20 and April 2 estimates provided here, will be minor. (See Addendum, appendix 8).



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Figure 1. Statistical area map for southern British Columbia.

2.0 STRAIT OF GEORGIA

2.1 BACKGROUND

In 1986, Gulf trollers organized an Inside Troll Advisory Committee (ITAC) which replaced the Gulf Trollers Association representation of the previous year. This new advisory group wished to make strong statements regarding allocation of salmon, particularly in opposition to the chinook limit for Gulf trollers. Unlike 1985, the ITAC did not want to separate allocation arguments from the development of fishing plans. In addition, ITAC wanted to avoid the use of beach boundaries and the shortened fishing weeks that were used in 1985. This approach resulted in extended formal discussions concerning the 1986 fishing plans, lasting from late March through end of May.

The original salmon allocations to Gulf trollers in the Strait of Georgia as defined by the Minister of Fisheries and/or his advisory council, were 50,000 chinook (final allocation was 48,000) and 262,000 sockeye; the latter was about 3.5% of the total allowable catch to all Canadian sockeye fisheries (the sockeye figure was later revised to 298,000 fish, Table 1). Coho, pink and chum were given no specific allocation to Gulf trollers in 1986. Regarding the chinook allocation, the 1986 chinook ceiling was adjusted downward from 50,000 to 44,100 pieces to account for 1985 catch overages and mortalities, as well as the new larger chinook size limit (see Section 2.2 for details). This ceiling was then increased by the Minister to 48,000 pieces later in the season. Details of the 1986 troll fishery in the Strait of Georgia are given in Appendix 2; Figure 2 shows management sub-areas for the Gulf.

2.2 DEVELOPMENT OF FISHING PLANS

2.2.1 New Chinook Ceiling

Of uppermost concern to the Department and to trollers was the continuation of the 50,000 piece chinook catch ceiling first established in 1985. This ceiling would be reached very early in the season unless some action restricting troll access to chinook was taken. Since the Department's desire was to avoid, if possible, any chinook non-retention fisheries (those fisheries in which prohibited species must be released alive; discards are called shakers), actions even more restrictive to trolling than those seen in 1985 were required. In addition, the 50,000 ceiling was to be reduced in 1986 to account for shaker mortalities and ceiling overages which occurred in the 1985 Georgia Strait troll fishery. These reductions amounted to 1,100 pieces for the 1985 overage and 2,300 pieces for shaker mortalities as negotiated in the 1985/86 Pacific Salmon Treaty meetings (Appendix 2). The new 1986 chinook ceiling after these reductions was 46,600.

2.2.2 Change In Chinook Size Limit

The ITAC wanted full access to salmon species not under the restriction of a catch ceiling. Therefore, any actions designed to restrict chinook catch should not preclude access to other species particularly coho. Under these conditions, time or area closures were not acceptable as a means of slowing chinook troll catches and, as a result, ITAC proposed an increase in chinook nose to fork size limit to 61 cm (24 inches) from 54 cm in 1985. Trollers also proposed to use barbless hooks to offset the mortalities that would occur to sublegal fish. Before DFO could accept a new larger minimum

Table 1. Catch ceilings and allocations for southern B.C. salmon troll fisheries, 1986.^a

Fishery	Species	Catch Ceiling/Allocation	Comments
1. Strait of Georgia Troll	Chinook	48,000 fish	- Minister's allocation of 263,000 fish for combined troll and sport fisheries. - For Areas 13-18 and 29.
	Coho	No specific allocations.	
	Sockeye	2.3% of Canadian allowable catch plus 100,000 for Fraser sockeye. Based on pre-season expectation of a Canadian TAC of 7,063,000, this would be 262,000 fish ^b (later revised to 298,000 fish). ^c	- MAC catch allocation for Areas 13 - 18 and 29. - Numerical value of allocation subject to change given actual TAC. - Allocation to be taken from Chilko and Adams stocks. Earlier stocks required for conservation.
	Pink	No specific allocations.	
	Chum	No specific allocations.	- MAC catch allocations for South Coast.
2. WCVI Troll	Chinook	360,000 fish	- Treaty catch ceiling for Areas 21-27, 121-127 and 130-1.
	Coho	1,750,000 fish	- Treaty catch ceiling for Areas 21-27, 121-127 and 130-1.
	Sockeye	20.5% of Canadian total allowable catch of Fraser sockeye. Based on pre-season expectation of a Canadian TAC of 7,063,000, this would be 1,448,000 fish (later revised to 1,766,000 fish). ^d	- MAC catch allocation for Areas 21-27, 121-127, 130-1, 111, 11 and 12. - Numerical value of allocation subject to change, given actual TAC. - Allocation to be taken from late Chilko and Adams stocks. Earlier stocks required for conservation, with the first part of Chilko run required for international and domestic allocations.
	Pink	Off year for Fraser River returns. No specific allocations.	- Period of non-retention required for conservation of Study Area non-Fraser stocks.
	Chum	Limited to historic levels.	- MAC catch allocations for South Coast. - Catches to be monitored and limited to historic levels of incidental catches.

^aBased on pre-season estimates of run sizes.^bOr about 3.5% of TAC.^cFinal allocation revised to 298,000 sockeye based on post-season estimate of sockeye run size at 16.7 million.^dFinal allocation revised to 1,766,000 sockeye based on post-season estimate of sockeye run size at 16.7 million.

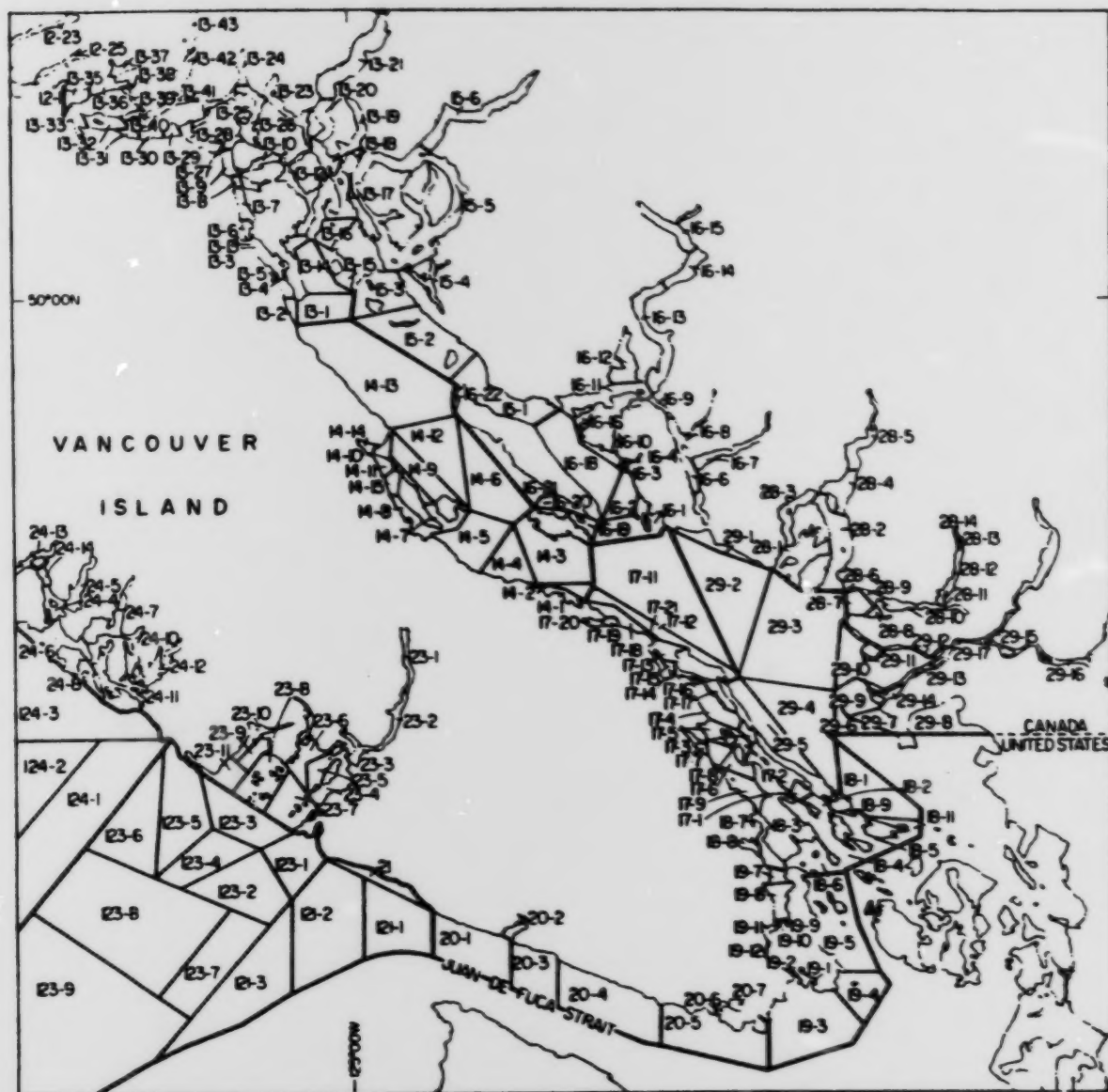


Figure 2. Management sub-areas for the Strait of Georgia.

size limit, a new catch ceiling had to be established. A troll catch of 50,000 pieces with a 62 cm size limit (62 cm was chosen instead of 61 cm to conform to the coastwide troll size limit for chinook of 62 cm nose to fork length) would mean that a higher proportion of spawning aged fish would be caught than with the 1985 ceiling and size limit of 54 cm. This redistribution of the catch would have a negative effect on chinook escapement rebuilding plans. In order to determine the new ceiling for the larger size limit, a simulation of the 1986 proposed fishing plan was conducted using the Georgia Strait model. This model is a cohort analysis and simulation of chinook and coho for the inside sport and troll fisheries (Argue et al. 1983). For the simulation it was assumed that: 1) chinook abundance in the Gulf in 1986 would be similar to that in 1985; 2) age composition of the sport and troll catches would be similar to that in 1984 (1985 age data were not used since they showed an atypically low age 2 component, Table 2); and 3) a sport catch of approximately 225,000 chinook would be realized.

The model prediction was that a 50,000 troll catch with a 62 cm size limit would have a 7% negative effect on chinook escapement. This relative change to spawner escapement was applied to the troll catch ceiling as compensation for catching larger and older fish by fishing to the larger size limit. However, instead of reducing the troll catch ceiling by 3,500 pieces (7%) as indicated above, the ceiling was reduced by 2,500 pieces. The 1,000 piece credit was assigned after negotiations with the ITAC regarding the effect of fishing with barbless hooks. These adjustments brought the 1986 chinook ceiling from 46,600 pieces (see Section 2.2.1) to 44,100 pieces.

The increased size limit could have had the effect of protracting chinook catch under the ceiling to the season end in late September. Age and size structure of the 1986 Gulf chinook population would have a great effect on the rate of catch accumulation. In 1984 and 1985, 87% and 90% respectively of the troll-caught chinook were age 3 fish (Table 2), and 35% of the 1984 catch consisted of fish less than 62 cm in length (Fig. 3); 1985 length data were not available. If Gulf chinook abundance in 1986 was as that expected, it was conceivable that trollers could fish for chinook and coho throughout the season and keep below the ceiling. (The 1986 Gulf chinook abundance forecast by DFO was based on a cohort analysis using observed 1985 catch at age information for Gulf sport and troll fisheries. A prediction of 30% fewer age 3 fish in 1986 than in 1985 was made. The prediction was based on observed poor recruitment of age 2 chinook to the 1985 sport fishery.) It was feared, however, that the 1986 chinook population in the Gulf might contain a different size and age structure than that observed in 1984 and 1985. Therefore, the Department wished to establish a set of contingency plans that would address the possibility of the chinook ceiling being reached earlier than the ideal time in late September. The ITAC declined this request. However, both DFO and ITAC agreed to try the new size limit.

As a result of the above negotiations and analyses, the 1986 chinook plan included a catch ceiling of 44,100 pieces, a size limit of 62 cm, and a requirement for barbless hooks (Appendix 2).

Table 2. Percent chinook catch at age by year for Strait of Georgia troll fishery, 1983-1985.^{a, b}

Age	1983	1984	1985
2	5.5	6.8	1.2
3	73.3	86.7	89.7
4	20.2	6.1	8.9
5+	1.0	0.4	0.2

^aSources: 1983/84 data - Carter et al. (1986).
1985 data - A. Wong (Salmon Services, Mark Recovery Program,
pers. comm.).

^bThese data were available prior to the 1986 fishing season and were used for the analysis of the proposed larger minimum troll size limit. Revisions of these numbers should be expected as more data become available.

JULY & AUG 1984 STRAIT OF GEORGIA TROLL

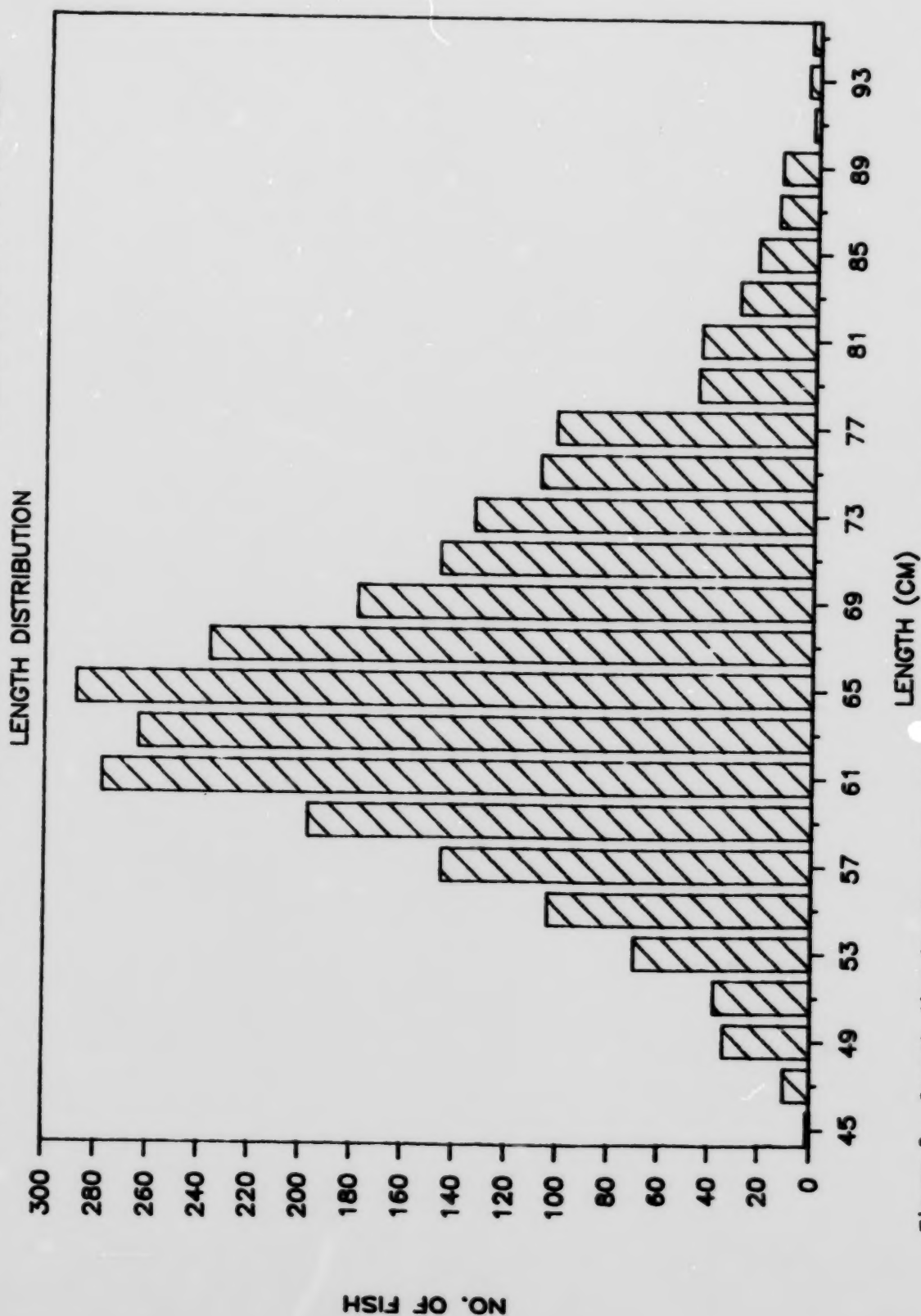


Figure 3. Length distribution of Strait of Georgia troll chinook catch for July and August 1984. Data from troll bio-sampling program (Carter et al. 1986).

2.2.3 Coho

Coho fishing plan negotiations with trollers were difficult. The Department wanted to constrain harvest rates to those levels experienced in recent years. However, no clear guidelines had been established by either DFO or by the Canada/U.S. Treaty to address coho conservation or international allocation concerns.

Trollers, through the ITAC, wanted increased opportunities over 1985 for harvesting coho, particularly in light of the increased hatchery production called Expo coho. The ITAC's initial proposal of conducting the fishery from June 15 to October 15, or 30 days more than the 1985 troll season, was not accepted by DFO. Instead, a June 20 to September 30 fishery was adopted, allowing an additional 10 fishing days over the 1985 troll season. Also, a small river mouth fishery at Qualicum River was to be conducted in October to harvest hatchery surplus of Expo coho. This compromise was reached with the understanding that no specific base period was specified for constraining coho harvest rates to recent years.

The fact that historically and until 1984, coho were shared and therefore, killed from April 15 to June 30 (Argue et al. 1987), could offset any increased harvest rates experienced by 10 extra days of fishing in 1986. Since no pre-season estimate of abundance is made for coho, it was difficult to define carefully how changes in the number of days fished would affect harvest rates in any given year.

2.2.4 Pink and Chum

No specific ceilings or fishing plans were developed for pink and chum salmon since the catch of these species was to be minor in 1986. The exception was a plan for pink salmon non-retention in Area 13 to conform to net fishery non-retention of pink salmon in the same area. Non-retention of pinks was implemented to address conservation concerns for South Coast stocks.

2.2.5 Sockeye

The pre-season catch allocation for sockeye in 1986 was 262,000 fish, given current expected run size (this figure was later revised to 298,000 fish, Table 1). Of the early to mid-summer timing stocks, only the Chilko stock was expected to have a harvestable surplus. The majority of the harvestable surpluses were to be in the late stocks of Birkenhead, Weaver and mainly Adams - Lower Shuswap sockeye runs. In order to conserve the early to mid-timing stocks and harvest primarily the more abundant later stocks, no fisheries (net or troll) were proposed until July 27. A maximum catch of 60,000 pieces was permitted prior to August 16, and extended opportunities to troll for the remaining sockeye catch were to be provided starting after that date.

2.3 CATCH AND IN-SEASON ACTIONS FOR STRAIT OF GEORGIA

Table 3 lists management actions taken in the Strait of Georgia in 1986. Table 4 gives weekly troll catches and days fishing by species, as reported by sales slips.

Table 3. Summary of 1986 Strait of Georgia troll fishery management actions.^a

PERIOD	MANAGEMENT ACTIONS			MANAGEMENT AREAS OPEN
	Species	Action	Purpose	
June 20 to July 9	Chinook, coho, chum and pink	Season opens with use of single barbless hooks and 62 cm chinook size limit. Trolling permitted 7 days/week.	Commence Gulf troll season- barbless hooks to help reduce mortality on sub-legal chinook.	Area 13, 13-1 to 13-3 and 13-14 to 13-20 and 13-23, Area 14 all sub-areas except 14-11 and 14-14 (Comox harbour). Area 15 all sub-areas except 15-6. Area 16 all areas. Area 17 all sub-areas except 17-7 and 17-14. Area 18 all sub-areas except 18-8. Area 29 sub-areas 29-1 to 29-5.
July 10 to July 16	Chinook, coho, chum and pink	Major chinook areas in Gulf closed. Only a centre portion remains open 7 days/week.	Slow rate of chinook catch.	14-12, 14-6, 14-3, 17-11 29-2, 29-3, 29-4 and 18-1.
July 17 to August 2	Coho, pink, chum	Chinook retention prohibited for balance of season and return to previous open areas.	Allow more access to coho while curtailing chinook catches.	Area 13, 13-1 to 13-3 and 13-14 to 13-20 and 13-23, Area 14 all sub-areas except 14-11 and 14-14 (Comox Harbour). Area 15 all sub-areas except 15-6. Area 16 all areas. Area 17 all sub-areas except 17-7 and 17-14. Area 18 all sub-areas except 18-8. Area 29 sub-areas 29-1 to 29-5.
August 3 to August 7	Coho, pink, chum and sock	Sockeye opens to trolling with barbed hooks permitted. Some river mouth closures in effect.	Commence sockeye troll fishery on early timing runs. River mouth closures to protect local chinook stocks.	Area 13, 13-1 to 13-3, 13-14 to 13-20 and 13-23. Area 14 all sub-areas except 14-11 and 14-14. Area 15 all sub-areas except 15-6. Area 16 all sub-areas. Area 17 all sub-areas except 17-7, 17-14, 17-15 and a portion of 17-9. Area 18 all sub-areas except 18-8. Area 29 sub-area 29-1 to 29-5, area 29-6 open only Aug 6, 8:00 a.m. to August 7, 8:00 a.m.
August 8 to August 10	Coho, pink, chum and sock	Northern portion of Area 13 open to trolling with non-retention of pinks.	Allow troll opportunities following net fisheries in Johnstone St. while protecting local pink stocks.	Area 13, 13-1 to 13-3, 13-14 to 13-20 and 13-23, and 13-7 to 13-10, 13-27 to 13-32 open 3 days/week. Area 14 all sub-areas except 14-11 and 14-14. Area 15 all sub-areas except 15-6. Area 16 all sub-areas. Area 17 all sub-areas except 17-7, 17-14, 17-15 and a portion of 17-9. Area 18 all sub-areas except 18-8. Area 29 sub-area 29-1 to 29-5.

^aArea 29 information is incomplete.

b pink retention permitted in all areas except the northern portion of Area 13.

(cont'd)

Table 3 (cont'd)

PERIOD	MANAGEMENT ACTIONS			MANAGEMENT AREAS OPEN
	Species	Action	Purpose	
August 11 to August 14	Coho, pink and chum	Sockeye retention prohibited. Areas 29-1 to 29-4 closed (mouth Fraser River). Barbed hooks prohibited.	Troll allocation of early timing sockeye run taken. Barbed hooks to protect sub-legal and non-target salmon.	Area 13, 13-1 to 13-3, 13-14 to 13-20 and 13-23. Area 14 all sub-areas except 14-11 and 14-14. Area 15 all sub-areas except 15-6. Area 16 all sub-areas. Area 17 all sub-areas except 17-7, 17-14, 17-15 and a portion of 17-9. Area 18 all sub-areas except 18-8, 18-1 and 18-11. Area 29 sub-area 29-5 only.
August 15 to August 17	Coho, pink, chum, sockeye	Sockeye permitted ^c only above Seymour Narrows in Area 13.	Provide troll opportunity following net fisheries in Johnstone Strait.	Area 13, 13-1 to 13-3, 13-14 to 13-20 and 13-23, and 13-7 to 13-10, 13-27 to 13-32 open 3 days/week. Area 14 all sub-areas except 14-11 and 14-14. Area 15 all sub-areas except 15-6. Area 16 all sub-areas. Area 17 all sub-areas except 17-7, 17-14, 17-15 and a portion of 17-9. Area 18 all sub-areas except 18-8, 18-1 and 18-11. Area 29 sub-area 29-5 only.
August 17 to August 19	Coho, pink, chum, sockeye	Sockeye retention permitted ^c in central Gulf.	To harvest Adams sockeye in Gulf.	Area 13, 13-1 to 13-3, 13-14 to 13-20 and 13-23. Area 14 all sub-areas except 14-11 and 14-14. Area 15 all sub-areas except 15-6. Area 16 all sub-areas. Area 17 all sub-areas except 17-7, 17-14, 17-15 and a portion of 17-9. Area 18 all sub-areas except 18-8, 18-1, and 18-11. Area 29 sub-area 29-5 only.
August 19 to August 21	Coho, pink, chum, sockeye	Sockeye retention permitted ^c off Fraser Rv. in a restricted portion of Area 29. Area 13 above Seymour Narrows closed.	To harvest Adams sockeye off River.	Area 13, 13-1 to 13-3 and 13-14 to 13-20 and 13-23. Area 14 all sub-areas except 14-11 and 14-14 (Comox Harbour). Area 15 all sub-areas except 15-6. Area 16 all areas. Area 17 all sub-areas except 17-7, 17-14, 17-15 and a portion of 17-9. Area 18 all sub-areas except 18-8. Area 29 sub-area 29-1, 29-2 and 29-5 only.
August 21 to August 24	Coho, pink, chum, sockeye	Sockeye permitted above Seymour Narrows in Area 13.	Provide trolling following Johnstone St. net fishery.	Area 13, 13-1 to 13-3 and 13-14 to 13-20 and 13-23 and 13-7 to 13-10, 13-27 to 13-32 open 3 days/week. Area 14 all sub-areas except 14-11 and 14-14 (Comox Harbour). Area 15 all sub-areas except 15-6. Area 16 all areas. Area 17 all sub-areas except 17-7, 17-14, 17-15 and a portion of 17-9. Area 18 all sub-areas except 18-8. Area 29, 29-5 only.

(cont'd)

^cBarbed hooks were permitted during all sockeye fisheries.

Table 3 (cont'd)

PERIOD	MANAGEMENT ACTIONS			MANAGEMENT AREAS OPEN
	Species	Action	Purpose	
August 24 to August 27	Coho, pink, chum, sockeye	Closed above Seymour Narrows.	Restrict trolling during Johnstone St. net fishery.	Area 13, 13-1 to 13-3 and 13-14 to 13-20 and 13-23. Area 14 all sub-areas except 14-11 and 14-14 (Comox Harbour). Area 15 all sub-areas except 15-6. Area 16 all areas. Area 17 all sub-areas except 17-7, 17-14, 17-15 and a portion of 17-9. Area 18 all sub-areas except 18-8. Area 29 sub-area 29-1, 29-2 and 29-5 only (Aug 26 and 27). Sub-area 29-5 only (Aug 24 and 25).
August 28 to August 31	Coho, pink, chum, sockeye	Sockeye permitted above Seymour Narrows in Area 13. Southern Gulf closed to all trolling (Area 29, 18-1 to 18-4, 18-5, 18-6 and 18-11 closed).	Majority of troll sockeye quota taken, remainder to be fished in a reduced area of the Gulf.	Area 13, 13-1 to 13-3, 13-14 to 13-20, 13-7 to 13-10, 13-23, 13-27 to 13-32. Area 14 all sub-areas except 14-11 and 14-14. Area 15 all sub-areas except 15-6. Area 16 all sub-areas. Area 17 all sub-areas except 17-7, 17-14, 17-15 and a portion of 17-9. Area 18 sub-areas except 18-8, 18-1, 18-4 to 18-6 and 18-11. Area 29, sub-area 29-5 only.
August 31 to September 5	Coho, pink, chum, sockeye	Closed above Seymour Narrows.	Restrict trolling during Johnstone St. net fishery.	Area 13, 13-1 to 13-3, 13-14 to 13-20, 13-23. Area 14 all sub-areas except 14-11 and 14-14. Area 15 all sub-areas except 15-6. Area 16 all sub-areas. Area 17 all sub-areas except 17-7, 17-14, 17-15 and a portion of 17-9. Area 18 all sub-areas except 18-8, 18-1, 18-4 to 18-6 and 18-11. Area 29, sub-area 29-5 only.
September 5 to September 16	Coho, pink, chum	Sockeye retention prohibited. Single barbless hooks required.		Area 13, 13-1 to 13-3, 13-14 to 13-20, 13-23. Area 14 all except 14-11 and 14-14. Area 15 all except 15-6. Area 16 all opened. Area 17 except 17-7, 17-14, 17-15 and a portion of 17-9. Area 18 all except 18-8, 18-1 and 18-11. Area 29 area 29-5 only.
September 16 to September 18	Coho, pink, chum	Trolling permitted above Seymour Narrows.	Allow further access to coho.	Area 13, 13-1 to 13-3, 13-14 to 13-20, 13-23 and 13-7 to 13-10, 13-27 to 13-32, 13-35 and 13-40. Area 14 all except 14-11 and 14-14. Area 15 all except 15-6. Area 16 all opened. Area 17 except 17-7, 17-14, 17-15 and a portion of 17-9. Area 18 all except 18-8, 18-1 and 18-11. Area 29 area 29-5 only.
September 18 to September 30	Coho, chum, pink	Trolling permitted in main Gulf area only.	Restrict trolling to below Seymour Narrows.	Area 13, 13-1 to 13-3, 13-14 to 13-20, 13-23. Area 14 all except 14-11 and 14-14. Area 15 all except 15-6. Area 16 all open. Area 17 except 17-7, 17-14, 17-15 and a portion of 17-9. Area 18 all except 18-8, 18-1 and 18-11. Area 29 sub-area 29-5 only, except 29-1 to 29-6, 1:00 PM to 7:00 PM, September 28 only.

(cont'd)

Table 3 (cont'd)

PERIOD	MANAGEMENT ACTIONS			MANAGEMENT AREAS OPEN
	Species	Action	Purpose	
October 1	Sockeye, coho, chum, pink	Majority of Gulf closes to trolling for balance of season. Sockeye permitted in Area 29. Coho fishing off Quailcum.	Close main troll season and some access to surplus hatchery coho. Allow make-up fishery on troll sockeye.	Area 29-1 to 29-6 and 14-9 and a portion of 14-5 inside a 5 mile offshore boundary (sockeye retention prohibited in Area 14).
October 1 to October 4	Coho, chum, pink	Sockeye closed for balance of season. Quailcum remains open.	Sockeye troll allocation taken.	14-9 and a portion of 14-5 only.
October 5 to October 7	None	Permit gillnetts in some area.	Troll closure to allow gillnetting.	All closed.
October 8 to October 11	Coho, chum, pink	Quailcum reopens.	Access to Expo hatchery surplus.	14-9 and a portion of 14-5 only.
October 12	CLOSED FOR BALANCE OF SEASON			

Table 4. Weekly troll catches and days fishing by species from sales slip records for Strait of Georgia in 1986.^a

WEEK	WEEKLY CATCH					TROLL DAYS	CUMULATIVE CATCH				
	CHINOOK	COHO	CHUM	PINK	SOCKEYE		CHINOOK	COHO	CHUM	PINK	SOCKEYE
6-1	0	0	0	0	0	0	0	0	0	0	0
6-2	0	0	0	0	0	0	0	0	0	0	0
6-3	2799	2975	0	39	0	99	2799	2975	0	39	0
6-4	18072	22206	12	8	83	832	20871	25181	12	47	83
7-1	10796	19672	3	11	3	766	31667	44853	15	58	86
7-2	7204	24669	0	8	141	651	38871	69522	15	66	227
7-3	2694	38660	674	1027	97	456	41565	108182	689	1093	324
7-4	683	21254	1453	678	419	572	42248	129436	2142	1771	743
7-5	241	16124	7	1162	1598	453	42489	145560	2149	2933	2341
8-1	458	7539	75	705	58795	656	42947	153099	2224	3638	61136
8-2	222	6570	461	748	60221	515	43169	159669	2685	4386	121357
8-3	85	2468	437	557	21232	541	43254	162137	3122	4943	142589
8-4	85	5204	40	14	101802	1057	43339	167341	3162	4957	244391
9-1	24	904	19	17	15985	232	43363	168245	3181	4974	260376
9-2	259	5313	14	266	1101	167	43622	173558	3195	5240	261477
9-3	12	3871	6	0	46	175	43634	177429	3201	5240	261523
9-4	0	2538	16	0	260	121	43634	179967	3217	5240	261783
10-1	51	2215	93	0	9461	207	43685	182182	3310	5240	271244
10-2	5	475	39	0	0	23	43690	182657	3349	5240	271244
10-3	0	0	0	0	0	0	43690	182657	3349	5240	271244
TOTAL	43690	182657	3349	5240	271244	7523					

^aCatch and troll days are from sales slips processed as of April 2, 1987. Data are for Statistical Areas 13-18 and 29. Sales slip estimates are from Wong (1983) database and are not adjusted to reflect times of openings and closings. The appearance of catches before openings (see Table 3 for dates) may be the result of test fisheries and of catches made in other areas that are open. The appearance of catches after closings (see Table 3 for dates) is the result of assignment of the catch to the date of landing.

2.3.1 Chinook

Trolling began as scheduled on June 20. However, by early July it was evident that chinook catch was progressing at a much faster rate than that outlined in the fishing plans. As a result, on July 10 with the catch estimated at 41,000 pieces, major areas were closed to all trolling (Table 3). Only the central or offshore portion of the Gulf remained open in order to avoid shoreline fishing and thereby reduce the rate of chinook catch and chinook shaking. Trollers however, felt that the shoreline closures were a severe restriction on access to coho and were willing to forego the remaining chinook catch in the 1986 ceiling in order to have the areas opened to coho.

The 1986 ceiling set initially at 44,100 pieces, was increased in early July to 48,000 as a result of a change in allocation made by the Minister of Fisheries and Oceans. On July 17, 1986, chinook retention was prohibited for the balance of the season and the previously closed areas were reopened. It was estimated by ICMP that the chinook catch by this date was 43,000; thus after July 17, 5,000 pieces were expected to be foregone to Gulf troll. Sales slip estimates, however, showed that total catch by July 17 (wk 7-3) was actually only 41,565 pieces (Table 4) for a foregone catch of 6,435 pieces. The total sales slip catch of chinook in the 1986 troll fishery in the Strait of Georgia was 43,690 (Table 4) which is below the ceiling level of 48,000 pieces.

2.3.2 Coho

Coho trolling continued uninterrupted until September 30 when the main Gulf fishery closed as scheduled. A small fishery was continued during October in Area 14 for hatchery Expo coho. However, fishing effort was minor with a maximum of six vessels counted on October 11 and no vessels reported fishing on some days. The October fishery was closed after eight days of fishing. In 1986, the total sales slip catch of coho in the Strait of Georgia troll fishery was 182,657 pieces (Table 4).

During the October fishery in Area 14, 362 coho were sampled from the landed catch through the Salmonid Mark Recovery Program. In order to compare the origin of coho captured in the troll and gillnet fisheries, only samples taken during October 8 - 13 when both fisheries participated, were considered. These samples indicated that 52% of the troll-caught coho were of hatchery origin and approximately 23% were Qualicum-Puntledge hatchery fish. Gillnet fisheries in the same area showed a very similar overall hatchery catch component (51%) but a much higher proportion of Qualicum-Puntledge stock (49%). This suggests that trollers were unable to target on local hatchery coho.

2.3.3 Sockeye

Sockeye concerns dominated the season for troll management from August 3 onward. The numerous time and area closures implemented are summarized in Table 3. For the most part, the sockeye fishery followed the general outline provided in the pre-season plan (Appendix 2). Sockeye trolling terminated on September 5, except for brief openings in Area 29 during September 28 to October 1. The total sales slip catch for 1986 was 271,244 pieces (Table 4), which is below the catch allocation of 298,000 fish.

2.3.4 Pink and Chum

Pink and chum catches were minor as expected, with 5,240 and 3,349 pieces respectively taken in the 1986 troll fishery (Table 4). No actions were taken to limit catch of these species.

2.3.5 Summary

The Strait of Georgia troll season started 10 days earlier in 1986 than in 1985. Catch results from sales slip records for the 1986 season were compared to catch ceilings (Table 5). Neither the chinook nor sockeye ceilings were exceeded in 1986, and catches were 9% below the ceiling level. Other salmon species in Georgia Strait had no ceiling to seasonal catch. Sockeye accounted for the largest salmon catch in 1986 at 271,244 pieces, followed by 182,657 coho, 43,690 chinook, 5,240 pinks and 3,349 chum. Cumulative weekly troll catches showed that, as with WCVI (see below), sockeye catch rates were more rapid compared to other species (Fig. 4).

2.4 SHAKER MONITORING FOR STRAIT OF GEORGIA

The Pacific Salmon Treaty calls for measurement of "new" (post 1984) induced fishing mortality on chinook salmon. Shaker losses resulting from non-retention fisheries were considered to be new induced fishing mortality and the monitoring program was implemented to assess these losses.

There were 84 days between July 17 and October 11, 1986 when trollers in the Strait of Georgia were required to release all chinook salmon. During this period, observers boarded trollers and recorded shaker rates. These observations coupled with some information from the Gulf Troll Logbook Program, formed the basis for estimating the average number of chinook released per troll day. Only chinook greater than 62 cm fork length were included in the calculation of shaker losses. Shakers under this size were considered to be part of the usual or expected cost of conducting a troll fishery with a 62 cm size limit, and therefore were not considered "new" losses. The new mortality caused by raising the size limit from 54 cm to 62 cm had already been accounted for by the lowered catch ceiling (see Section 2.2). It is estimated that a total of 5,151 shakers longer than 62 cm were released during the 1986 chinook non-retention fishery (Appendix 3). The estimate of shaker deaths (1,545) was obtained by multiplying the number of shakers by an assumed mortality rate of 0.3 on released fish (Argue et al. 1983).

2.5 TROLL GEAR COUNTS FOR STRAIT OF GEORGIA

Aerial overflights of the Strait of Georgia are conducted as part of the Strait of Georgia Creel Survey Program (Shardlow et al. MS 1988). These flights cover a distance from Sheringham Point to Granite Point, and utilize two aircraft, one for the north and one for the south route (Fig. 5). All troll gear sighted are recorded by Statistical Area and the data are used by the ICMP for estimating in-season Gulf troll catch.

Between June 20 and October 11, 1986, a total of 38 aerial surveys yielded a total troll gear count of 2,772, of which 40% were observed in Area 14 (Table 6). Total daily counts for the overall area surveyed ranged from a maximum of 188 vessels observed during the peak sockeye fishery in early August, to a minimum of 3 vessels during the Area 14 coho fishery in early October.

Table 5. Summary of catch ceilings/allocations and actual catches for the 1986 South Coast troll season.^a

Species	Catch Ceiling/Allocation	Actual Catch ^b
<u>STRAIT OF GEORGIA</u>		
Chinook	48,000 pieces	43,690
Coho	No ceiling	182,657
Sockeye ^c	2.3% of Can. TAC plus 100,000 pieces (298,000)	271,244
Pink	No ceiling	5,240
Chum	No ceiling	3,349
<u>WEST COAST VANCOUVER ISLAND</u>		
Chinook	360,000 pieces	337,918
Coho	1,750,000 pieces	2,025,400
Sockeye ^c	20.5% of Can. TAC (1,766,000)	1,770,020
Pink	No ceiling	198,093
Chum	Historical proportion of commercial catch	360,647

^aFor more details on catch ceilings and allocations, see Table 1.

^bCatch estimates based on sales slips accumulated to April 2, 1987.

^cBased on total run size of 16.7 million and other preliminary information.

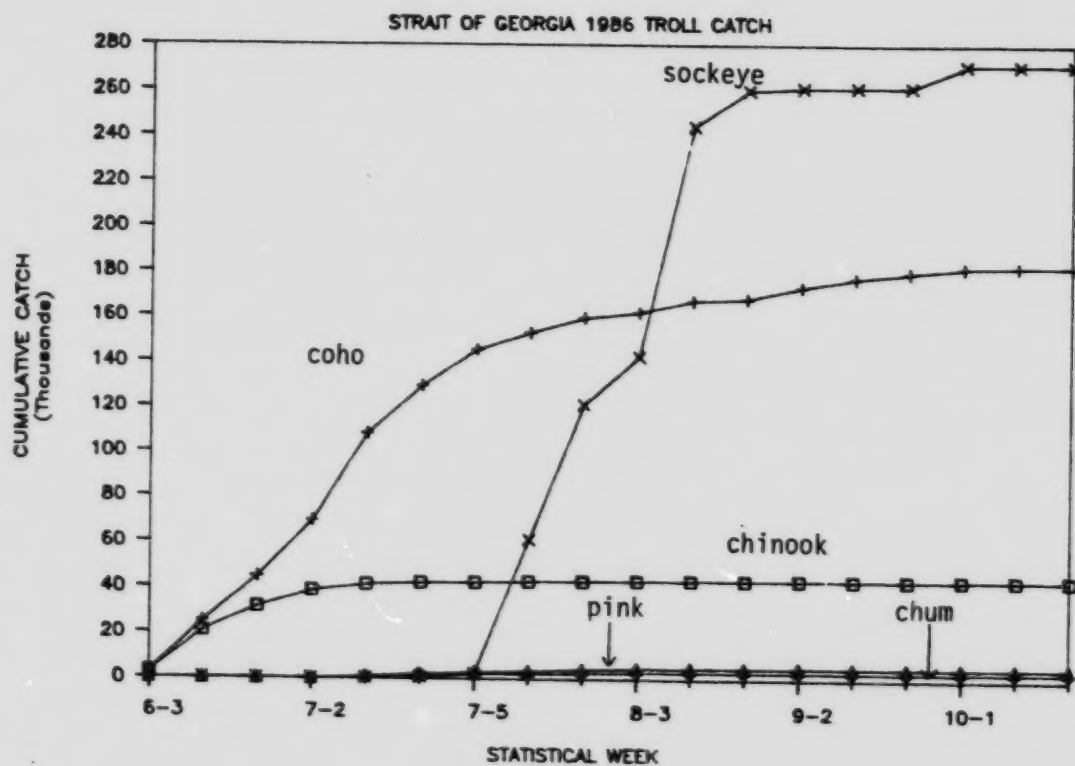


Figure 4. Cumulative weekly troll catches by species from sales slip records for Strait of Georgia in 1986.

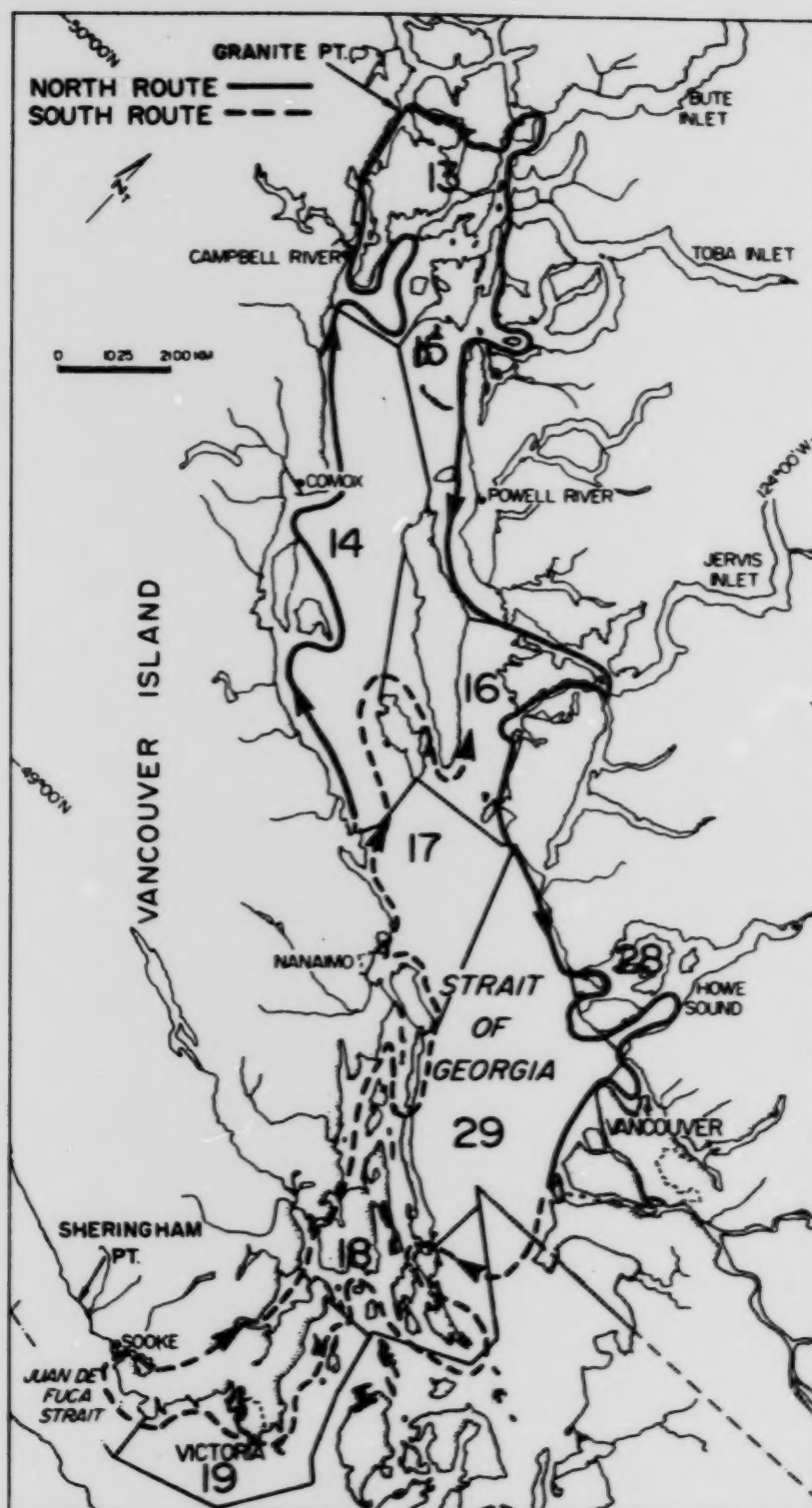


Figure 5. Path flow during aerial counts of troll effort in Strait of Georgia.

Table 6. Daily troll gear counts by Statistical Area as determined from aerial overflights in Strait of Georgia, 1986.

DATE	STATISTICAL AREA							TOTAL
	13	14	15	16	17	18	29	
Jun 20	39	74	11	20	19	2	0	165
Jun 22	40	91	12	9	10	0	3	165
Jun 24	22	36	6	3	4	0	0	71
Jun 26	18	62	9	4	6	0	3	102
Jun 28	40	56	8	4	15	0	12	135
Jul 3	16	41	6	4	11	0	0	78
Jul 5	34	86	10	4	13	0	6	153
Jul 7	25	86	8	2	6	0	12	139
Jul 10	0	6	1	0	3	0	0	10
Jul 11	2	26	1	4	6	0	0	39
Jul 12	0	62	0	5	16	1	2	86
Jul 15	1	65	0	1	9	2	3	81
Jul 17 ^a	26	22	5	8	8	0	0	69
Jul 19	27	50	3	12	21	0	1	114
Jul 20	14	42	7	9	23	0	2	97
Jul 23	7	24	4	4	1	2	0	42
Jul 26	3	23	3	4	7	0	0	40
Jul 28	33	21	2	9	7	0	0	72
Aug 1	1	35	2	7	12	0	1	58
Aug 2	0	3	2	1	3	0	3	12
Aug 5	2	7	2	10	0	1	106	128
Aug 8 ^b	43	4	1	7	1	4	128	188
Aug 13	0	11	0	2	0	0	0	13
Aug 17	0	5	1	26	37	26	0	95
Aug 18	0	3	1	10	5	52	0	71
Aug 28	1	4	3	0	0	0	151	159
Aug 29	50	0	0	14	0	0	0	64
Aug 30 ^c		2	0	15	0	1	0	18+
Sep 4	1	10	3	37	1	4	0	56
Sep 7	0	21	5	4	0	0	0	30
Sep 10	0	18	1	3	1	1	0	24
Sep 13	0	29	1	6	4	0	0	40
Sep 15	0	26	3	5	5	0	1	40
Sep 20	0	24	3	3	6	0	0	36
Sep 25	0	24	1	3	2	0	0	30
Sep 28	0	1	1	0	2	0	39	43
Oct 8	0	3	0	0	0	0	0	3
Oct 11	0	6	0	0	0	0	0	6
TOTAL	38	445	1,109	126	259	264	96	473
SURVEYS								2,772

^a July 17 count for Area 13 is only an estimate due to fog.^b August 8 count for Area 13 is from above Seymour Narrows.^c August 30 count incomplete due to fog in Area 13.

3.0 WEST COAST VANCOUVER ISLAND

3.1 BACKGROUND

In 1986 trollers with "outside" licenses organized a committee to address fishing plans for the upcoming season. This committee was set up to represent the views of more than the Pacific Trollers Association (PTA) who had been the primary spokesmen for the WCVI trollers in 1985.

The new Outside Troll Co-Management Committee (OTCC) consisted of representatives from the PTA, Native Brotherhood, Northern Trollers Association (NTA), and the United Fishermen and Allied Workers Union (UFAWU). The 1986 plans for WCVI were developed through consultation with OTCC in meetings that began April 7 and continued to June 12, 1986, eight days before fishing commenced.

The management plans developed were directed toward keeping troll catches within the prescribed catch ceilings for WCVI (Table 1). For chinook and coho these ceilings were 360,000 and 1.75 million respectively, as specified under the Pacific Salmon Treaty for the second year in a row. Troll catch of sockeye was to be limited to 20.5% of the Canadian total allowable catch of Fraser sockeye. There was no specific allocation for chum, but their catch was to be limited to historic levels as directed by the Minister's Advisory Council. Since 1986 was an off year for pink salmon, no specific allocation or ceiling was prescribed for this species. However, DFO expressed a conservation concern for non-Fraser pink stocks, and access to pinks was restricted during the early part of the troll season. Details of the WCVI troll fishing plans for 1986 are given in Appendix 4; Figures 6 and 7 show management sub-areas for the WCVI.

Catch ceilings coupled with the understanding that troll seasons and areas were to remain similar to those of recent past years, provided a framework for the WCVI fishing plan discussions. Also considered was the Department's desire to avoid, where possible, non-retention fisheries due to the disruptive effect high shaker catches would have on fish stocks and future trolling plans (the Canada/U.S. Treaty requires that shaker deaths be deducted from the next year's catch ceiling for chinook).

3.2 DEVELOPMENT OF FISHING PLANS

Appendix 5 outlines and evaluates the troll fishing plans considered for the 1986 season. Basically, two main plans were developed for analysis and review; a third plan called Plan C was a variation of Plan A (see Appendix 5). Plan A had no spring-season fishery but a single summer fishery starting June 20. Plan B had a spring fishery similar to the trolling plans of the past two years. The main advantage to Plan A compared to Plan B was that by avoiding the spring fishery, the chance of non-retention fisheries was reduced as was the cost of monitoring to the Department. On the other hand, Plan B had the advantage to fishermen of providing chinook to the market in spring, and the additional advantage of spreading catch over time thereby avoiding concentrated harvest on fewer potentially weaker stocks.

The expected harvest rates exerted on chinook and coho by each plan were very similar according to the pre-season analysis (see Appendix 5, Appendix Table 5-2) and in the end, Plan A with a single summer fishery

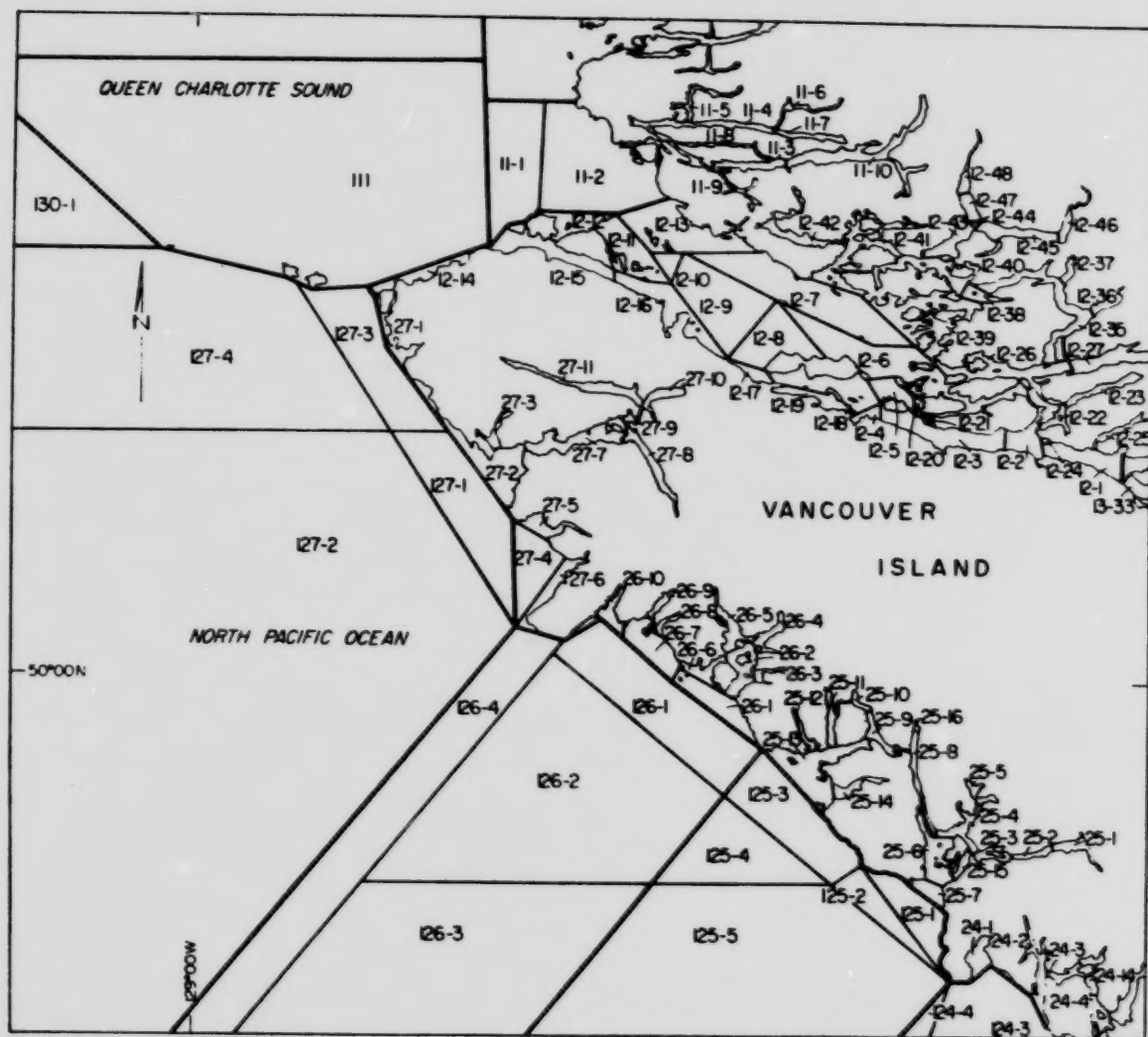


Figure 6. Management sub-areas for the Northwest Coast of Vancouver Island and Johnstone Strait.

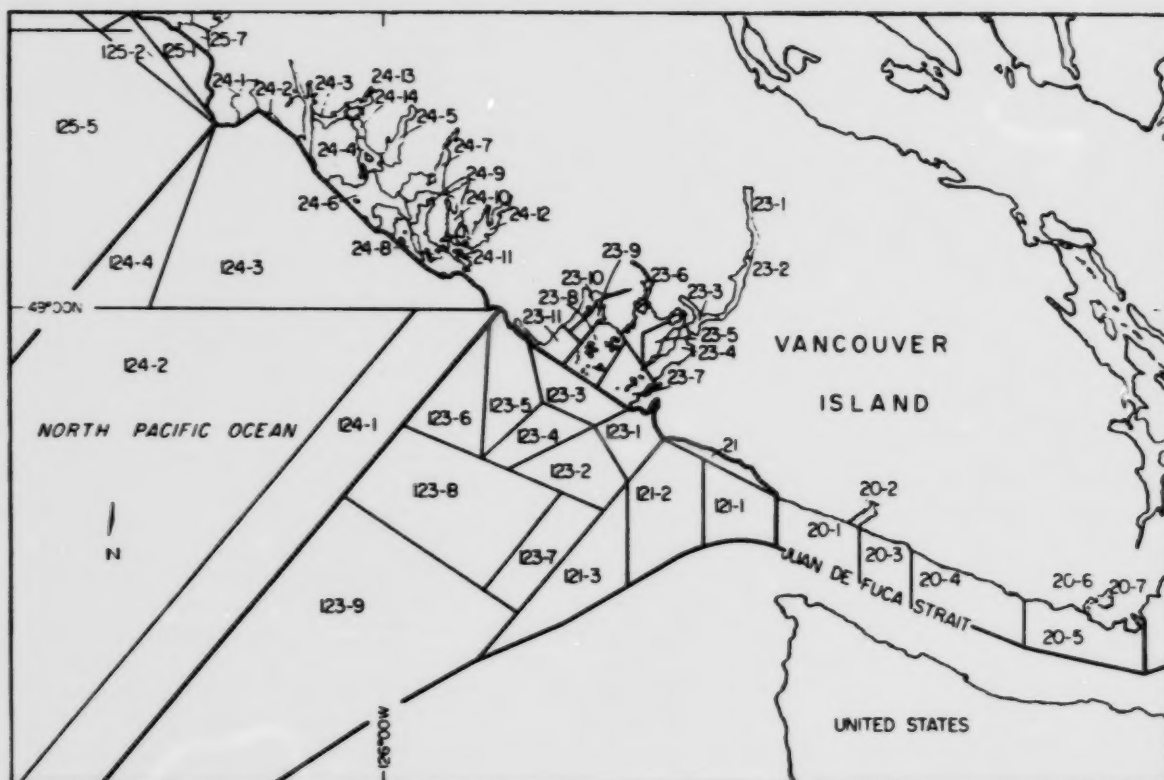


Figure 7. Management sub-areas for the Southwest Coast of Vancouver Island.

beginning June 20 was adopted for the 1986 season.

3.2.1 Red Line

Management for catch ceilings required that again in 1986, certain benchmarks be established before fishing began. These benchmarks were in-season catches called "red line" catches, that would signal a large enough departure from expected catches of chinook and coho to warrant a change in fishing plans.

The "red line" was generated by incrementing the ideal cumulative catch by a proportion that diminished with time. For example, for chinook the initial proportion was 0.30 during week 6-4 and decreased by 0.03 weekly until week 9-1 when it was 0.02 (Table 7). The proportion was 0.01 by week 9-2 and 0.005 by week 9-3 after which time it was held at zero until the end of the season. If in-season catches exceeded the red line value, restrictions to fishing would be imposed until the catch was restored to the ideal level. The proportions by which red line catches exceeded ideal catches for chinook (Table 7) and for coho (Table 9) were larger at the beginning than at the end of the season for two reasons. First, higher than ideal catches early in the season could be more easily compensated for by management actions than could similar catches later in the season. Second, confidence about in-season catch estimates became much better as more sampling data became available during the season (Webb et al. 1983). In other words, there was less certainty at the beginning of the season that in-season catches were accurate and larger red line percentages reflected this uncertainty.

Expected weekly catches for chinook and coho were forecasted for the period from week 6-4 to 10-1. If possible, it was desired to have a fishery without non-retention from June 20 until October 15. A troll fishing simulation model (Appendix 6) that used recent historical catch and effort data, and included the influence of fishing for five salmon species, current stock abundances, as well as troll prices, was used to predict the magnitude of anticipated chinook and coho catches. It was expected that, depending on fish availability and price, Adams sockeye might have a great impact on troll catches of chinook and coho salmon. Assumptions made were that the troll fishing effort and chinook abundance available to WCVI troll in 1986 would be similar to that observed in 1985, and that weekly catches would accrue according to an average proportional catch progression from 1982, 1984 and 1985 statistics for the same period. It was assumed that 1986 coho abundance would be slightly less (-5%) than that estimated during 1985. To determine a weekly rate of coho catch, the five-year (1981-85) average rate of accumulation was backdated one week to coincide with the earlier opening for coho (Table 9).

Expected prices provided by the OTCC relative to prices in 1985, showed a 30% increase for sockeye and a 20% decrease for large chinook. Pre-season sockeye predictions were for a run size of 14,600,000 with a 50% diversion rate (proportion of the run migrating through Johnstone Strait).

Table 7. WCVI troll catch projections, red line and estimated catch for chinook in 1986 (catch is cumulative in pieces).

WEEK	EXPECTED CATCH ^a	IDEAL RED LINE CATCH ^b	RED LINE PERCENT	RED LINE CATCH	IN-SEASON CATCH ESTIMATE ^c	SALES SLIP CATCH ESTIMATE ^d
6/3	0	0				71007
6/4	52128	48257	30.0%	62733	104900	130868
7/1	96315	89161	27.0%	113234	145300	173716
7/2	133676	123747	24.0%	153447	175000	202087
7/3	172160	159373	21.0%	192841	193900	234470
7/4	206215	190898	18.0%	225260	214200	259594
7/5	229637	212580	15.0%	244467	232300	273492
8/1	260087	240768	12.0%	269661	278400	291481
8/2	290260	268700	9.0%	292883	295700	304658
8/3	316624	293106	6.0%	310692	318600	337918
8/4	337938	312837	3.0%	322222	339800	337918
9/1	354097	327796	2.0%	334352	357500	337918
9/2	367544	340244	1.0%	343647	363100	337918
9/3	378684	350556	0.5%	352309		337918
9/4	388885	360000	0.0%	360000		337918
10/1	388885	360000	0.0%	360000		337918

^aTotal expected catch has been simulated based on expected abundance and fishing effort levels similar to 1985, prices provided by the PTA and diversion rate of 50%.

Expected catch accumulates according to catch patterns observed in 1982, 1984 & 1985.

^bThe expected catch was adjusted to yield total "ideal catch" of 360,000 pieces.

^cAs provided in-season each week (Table 8).

^dAs provided by sales slips processed as of April 2, 1987. Catches on sales slips backdated one week to reflect time of catch (see Table 12).

Table 8. In-season chinook troll catch estimation for WCVI as given each week during the fishery in 1986 (catch is cumulative in pieces).^a

In-season estimates as reported after	Statistical Week Of Catch													
	each week.	6/3	6/4	7/1	7/2	7/3	7/4	7/5	8/1	8/2	8/3	8/4	9/1	9/2
7/1		31,000	73,800	40,400										
7/2		34,000	77,600	38,300	25,100									
7/3		34,000	77,600	38,000	24,300	20,000								
7/4		34,000	77,600	38,000	23,900	19,500	21,200							
7/5			111,600 ^b	38,000	23,900	19,500	20,600	18,700						
8/1			108,700 ^b	48,800	34,300	25,000	23,000	21,800	16,800					
8/2			109,800 ^b	49,800	35,300	27,200	24,400	21,500	15,400	12,300				
8/3			111,200 ^b	51,300	36,500	28,100	25,600	20,700	15,100	11,100	19,000			
8/4			111,300 ^b					165,900 ^c	14,900	11,000	16,200	20,500		
9/1			111,300 ^b					166,100 ^c	15,200	12,300	24,700	27,900	0	
9/2			112,300 ^b					168,400 ^c	15,800	13,100	25,100	28,400	0	0
TTD (A) ^d			104,900	145,300	175,000	193,900	214,200	232,300	278,400	295,700	318,600	339,800	357,500	363,100
TTD (B) ^e			112,300	163,600	200,100	228,200	253,800	280,700	296,500	309,600	334,700	363,100	0	0

^aData Source: Bulletin 1 through 11 In-Season Catch Estimation Program.

^bAll of June included.

^cAll of July included.

^dTotal to date as seen on a real time basis during the fishery.

^eTotal to date as given on the last week (9/2) September 18, 1986.

Table 9. WCVI troll catch projections, red line and estimated catch for coho in 1986 (catch is cumulative in pieces).^a

WEEK	1981	1982	1983	1984	1985 ^b	1985 ^c	1981-85 AVERAGE ^d	1986 RED LINE IDEAL ^e PERCENT	RED LINE IN-SEASON CATCH ESTIMATE ^f	SALES SLIP ESTIMATE ^g
6-3	0	0	0	0	0	0	0	30.0%	431316	251281
6-4	0	0	0	0	0	0	0	27.0%	696664	555956
7-1	310282	269237	498196	426020	174234	260495	335594	24.0%	614700	852323
7-2	450916	511952	874731	600799	335891	331607	554858	21.0%	960466	1068465
7-3	618807	775301	1248309	807533	467323	498996	783471	18.0%	1148366	1275627
7-4	737984	1034191	1348613	1028014	615041	643765	959969	15.0%	1291200	1432889
7-5	820526	1103020	1638956	1225145	746756	781692	1106881	12.0%	1397056	1520856
8-1	909567	1212677	1764965	1383469	873280	879434	1228792	9.0%	1500074	1619806
8-2	1052567	1296516	1850105	1581289	993239	1019227	1354743	6.0%	1585131	1693580
8-3	1114377	1391717	1927927	1714601	1113379	1120264	1452400	4.0%	1616065	1666000
8-4	1201816	1470206	1992164	1842720	1203641	1212051	1542110	2.0%	1658700	1666000
9-1	1274929	1524398	2049243	1942157	1275431	1265167	1613232	1.0%	1706249	1666000
9-2	1322551	1602855	2101495	2101721	1331458	1314407	1692016	0.0%	1728682	1666000
9-3	1351908	1681637	2132638	2117081	1372910	1360434	1731235	0.0%	1748041	1666000
9-4	1385323	1777436	2167149	2117081	1393654	1387594	1768129	0.0%	1750000	1666000
10-1	1385323	1777436	2167149	2117081	1403561	1389055	1770110	0.0%	1750000	1666000
10-2	1385323	1777436	2167149	2117081	1403561	1389055	1770110	0.0%	1750000	1666000

^aSource: Data are for Statistical Areas 21 - 27.

Statistics for 1981, 1982, 1983, 1984 are from Wong (1983) salmon catch database.

Catches backdated one week to reflect time of catch.

^bCatches as available when red line was generated (March 12, 1986).

^cActual 1985 sales slip catch figures (as accessed April 2, 1987).

^dAverage uses "1985^b" column.

^e1986 ideal catch assumes a cumulative proportion based on the 1981-85 average, backdated one week for an earlier opening.

^fAs seen each week in-season (Table 10).

^gAs provided by sales slips processed as of April 2, 1987. Catches on sales slips backdated one week to reflect time of catch (see Table 12).

Table 10. In-season coho troll catch estimation for WCVI as given each week during the fishery in 1986 (catch is cumulative in pieces).^a

In-season estimates as reported after	Statistical Week Of Catch													
	each week.	6/3	6/4	7/1	7/2	7/3	7/4	7/5	8/1	8/2	8/3	8/4	9/1	9/2
7/1	104,600	311,700	198,400											
7/2	115,000	335,400	202,100	166,000										
7/3	115,000	335,400	202,800	176,800	70,000									
7/4	115,000	335,400	202,800	176,500	100,900	58,400								
7/5	450,400 ^b	202,800	176,500	101,400	99,300									
8/1	475,100 ^b	292,400	229,700	143,500	101,500	84,900								
8/2	486,200 ^b	301,800	237,900	160,500	121,800	79,600	43,000							
8/3	493,200 ^b	310,000	247,100	169,800	133,200	82,100	43,000	73,100						
8/4	493,200 ^b					998,700 ^c	83,800	51,400	188,700	208,400				
9/1	493,200 ^b					1,001,200 ^c	87,300	58,600	223,400	234,200	0			
9/2	500,900 ^b					1,024,500 ^c	91,900	68,400	228,400	239,400	0	0		
TTP ^d		614,700	818,500	900,000	989,000	1,117,000	1,444,400	1,551,900	1,666,000	2,024,300	2,098,000	2,153,500		
TTP ^e		726,300	973,400	1,143,200	1,276,400	1,525,400	1,617,300	1,685,700	1,914,100	2,153,500	0	0		

^aData Source: Bulletin 1 through 11 In-Season Catch Estimation Program.^bIncludes week 6/3.^cTotal for July.^dTotal to date as seen on a real time basis during the fishery.^eTotal to date as given on the last week (9/2) September 18, 1986.

Based on the simulation model (Appendix 6), it was expected that:

1) for chinook fishing without restrictions, the catch ceiling of 360,000 would be exceeded by 29,000 pieces. The expected catch was adjusted to yield an "ideal catch" of 360,000 pieces (Table 7).

2) for coho the resulting catch would be very close to the ceiling of 1,750,000. In this case, the expected catch was the "ideal" catch (Table 9).

Contingency plans in the form of pre-designated potential closures were developed for chinook salmon (Fig. 8). One or any combination of these closures would be implemented after consultation with trollers if catches exceeded red line values.

3.2.2 Hot Line

In-season consultation with trollers presents special logistical problems. Unlike the net fleet, trollers do not return to port on a regularly scheduled basis, but fish continuously. This means that communication regarding red line catches, and implementation of contingencies or changes to fishing plans are not possible through the normal process of land-based meetings. The OTCC proposed the use of VHF radio telephone conference calls to address this problem. A committee of pre-designated Department and OTCC members, called the Hot Line committee, was formed which constituted conference call candidates. Hot Line conference calls were used at first to address only the implementation of closures as outlined in the contingency plans. However later in the season, these conferences were scheduled weekly to address current problems related to fishing plans in general.

3.3 CATCH AND IN-SEASON ACTIONS FOR WCVI

Table 11 lists management actions taken on the WCVI in 1986. Table 12 gives weekly troll catches and days fishing by species, as reported in sales slips. Area closures on the Big Bank (Fig. 9) were implemented to slow the rate of chinook catch; non-retention of other species occurred when ceilings were reached. In 1986, chinook and coho ceilings were achieved earlier than expected and, as a result, the WCVI troll season was closed earlier (August 30) than at any time in the history of the fishery. Moreover, since June 20 was historically the latest troll starting date, the 1986 WCVI troll season was the shortest on record.

3.3.1 Chinook

The chinook in-season catches in first weeks of the 1986 troll fishery were above the red line value (Table 7). The Big Bank closure called "chinook No. 1" (Fig. 9) was implemented immediately after the first Hot Line conference call. Chinook in-season catches remained above red line values (Fig. 10, Table 7) for each week of the 1986 season (except weeks 7-4 and 7-5); consequently, the closure remained in effect for the duration of this fishery. On August 22, 1986, the chinook No. 1 closure was redefined to conform to Pacific Fishery Management units 123-7 and 123-8 (shown as closure F in Fig. 9) for the purpose of enforcement of the closure. Legal requirements were believed to be such that those trollers who failed to comply with the original closure could not be charged unless the closure was redefined as Management units. After the redefinition, the 12 to 15 trollers who had violated the compliance closure left the closed area.

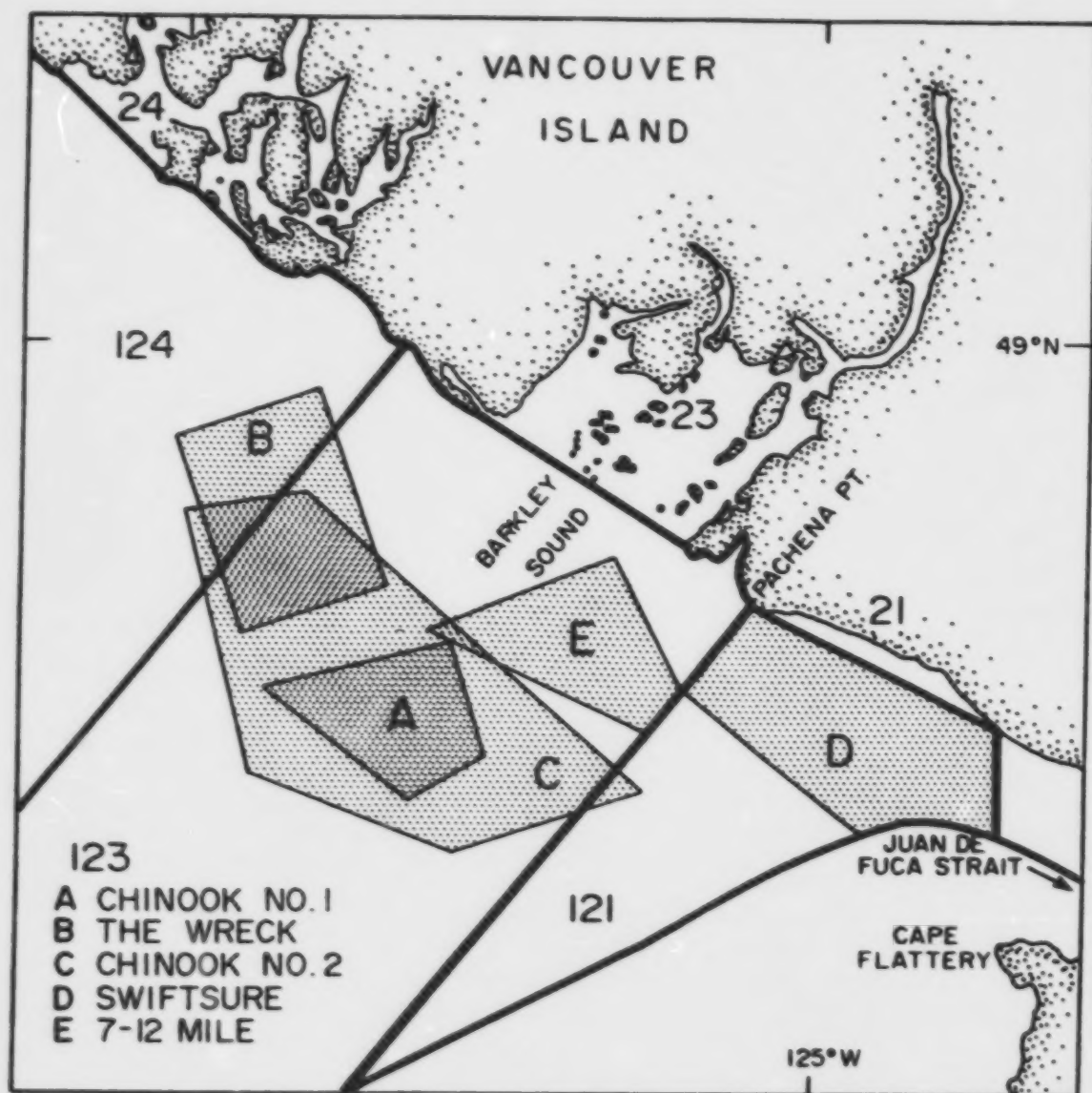


Figure 8. Potential area closures as proposed in 1986 by the WCVI salmon troll management committee.

Table 11. Summary of 1986 WCVI troll fishery management actions.

PERIOD	MANAGEMENT ACTIONS		MANAGEMENT AREAS OPEN
	Species	Action	Purpose
June 20 to June 30	Chinook, coho and chum	Fishery opens with barbed hooks permitted, some closures inside surfline, Swifsure Bank (121-1, 121-2, 123-1) closed.	Commence season while protecting local chinook (inside surfline) stocks, sublegal chinook and Fraser coho (Swifsure).
July 1 to July 8	Chinook, coho and chum	Swifsure opens.	Provide opportunities for coho and legal sized chinook.
July 9 to July 30	Chinook, coho and chum	Big Bank closure (chinook no. 2, see Fig. 9).	Slow rate of chinook catch.
July 31	All species open	Sockeye and pink open to trolling, except for some areas inside surfline, Big Bank closure reduced in size (chinook no. 1 see Fig. 9).	Commence sockeye and pink fishery, increase rate of chinook catch.
August 1 to August 14	All species open	Additional closures inside surfline, chinook no. 1 remains closed.	Protect local chinook and sockeye stocks.
August 15 to August 21	Chinook, coho and pink	Sockeye and chum non retention. Chinook no. 1 remains closed.	Troll allocation of sock. and chum taken.
August 22 to August 29	Chinook, coho and pink	Chinook no. 1 redefined as Mgmt. Area 123-7 & 123-8.	Change compliance closure to legal closure.
August 30 to September 5	Chinook, coho and pink	Closed to all trolling in Areas 21 to 27 and 121 to 127.	Troll allocation chinook and coho reached.
September 5		CLOSED TO ALL TROLLING	

Table 12. Weekly troll catches and days fishing by species from sales slip records for WCVI in 1986; Johnstone Strait chum, pink and sockeye catches and days fishing included.^a

WEEK	WEEKLY CATCH					TROLL DAYS	CUMULATIVE CATCH				
	CHINOOK	COHO	CHUM	PINK	SOCKEYE		CHINOOK	COHO	CHUM	PINK	SOCKEYE
4-5	0	0	0	0	0	0	0	0	0	0	0
5-1	0	0	0	0	0	0	0	0	0	0	0
5-2	0	0	0	0	0	0	0	0	0	0	0
5-3	0	0	0	0	0	0	0	0	0	0	0
5-4	0	0	0	0	0	0	0	0	0	0	0
6-1	0	0	0	0	0	0	0	0	0	0	0
6-2	0	0	0	0	0	0	0	0	0	0	0
6-3	7589	18976	1275	63	2540	355	7589	18976	1275	63	2540
6-4	63418	232305	14282	118	197	3635	71007	251281	15557	181	2737
7-1	59861	304675	39112	1330	680	4758	130868	555956	54669	1511	3417
7-2	42848	296367	53784	1757	4930	5680	173716	852323	108453	3268	8347
7-3	28371	216142	42340	5680	7221	5031	202087	1068465	150793	8948	15568
7-4	32383	207162	72710	9380	3867	6292	234470	1275627	223503	18328	19435
7-5	25124	157262	29171	16342	28792	4868	259594	1432889	252674	34670	48227
8-1	13898	87967	44515	61816	358384	6568	273492	1520856	297189	96486	406611
8-2	17989	98950	49175	66754	1029918	9963	291481	1619806	346364	163240	1436529
8-3	13177	73694	11853	27554	310016	4646	304658	1693500	358217	190794	1746545
8-4	33260	331900	2233	6672	23130	6556	337918	2025400	360450	197466	1769675
9-1	0	0	99	401	345	527	337918	2025400	360549	197867	1770020
9-2	0	0	98	226	0	101	337918	2025400	360647	198093	1770020
TOTAL	337918	2025400	360647	198093	1770020	58980					

^aCatch and troll days are from sales slips processed as of April 2, 1987. Chinook and coho catches are for Statistical Areas 21-27, 121-127 and 130-1. Chum, pink, and sockeye catches and effort, are for Statistical Areas 11, 12, 21-27, 121-127 and 130-1. Sales slip estimates are from Wong (1983) database and are not adjusted to reflect times of openings and closings. The appearance of catches before openings (see Table 11 for dates) may be the result of test fisheries and of catches made in other areas that are open. The appearance of catches after closings (see Table 11 for dates) is the result of assignment of the catch to the date of landing.

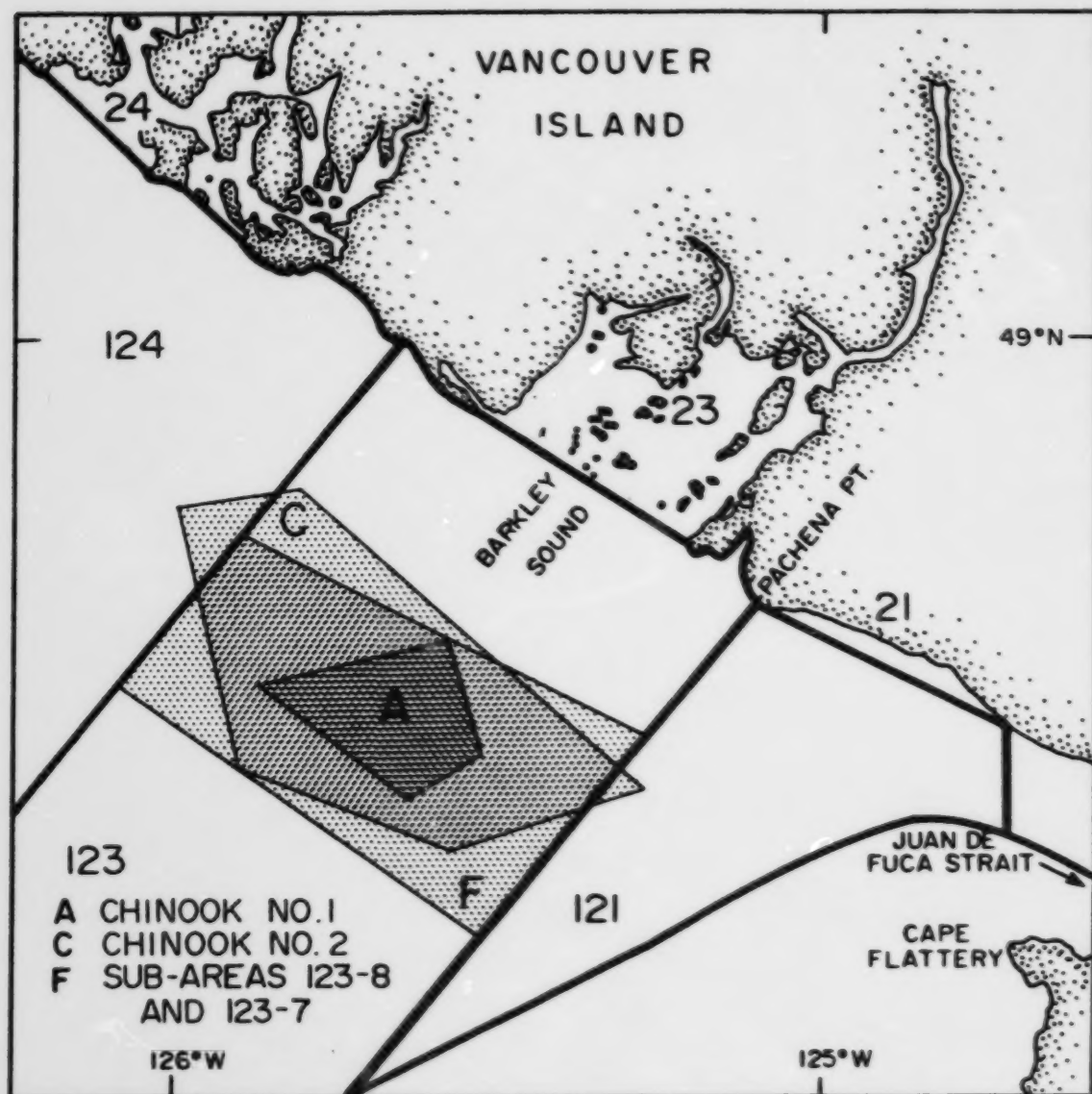


Figure 9. Area closures implemented in 1986.

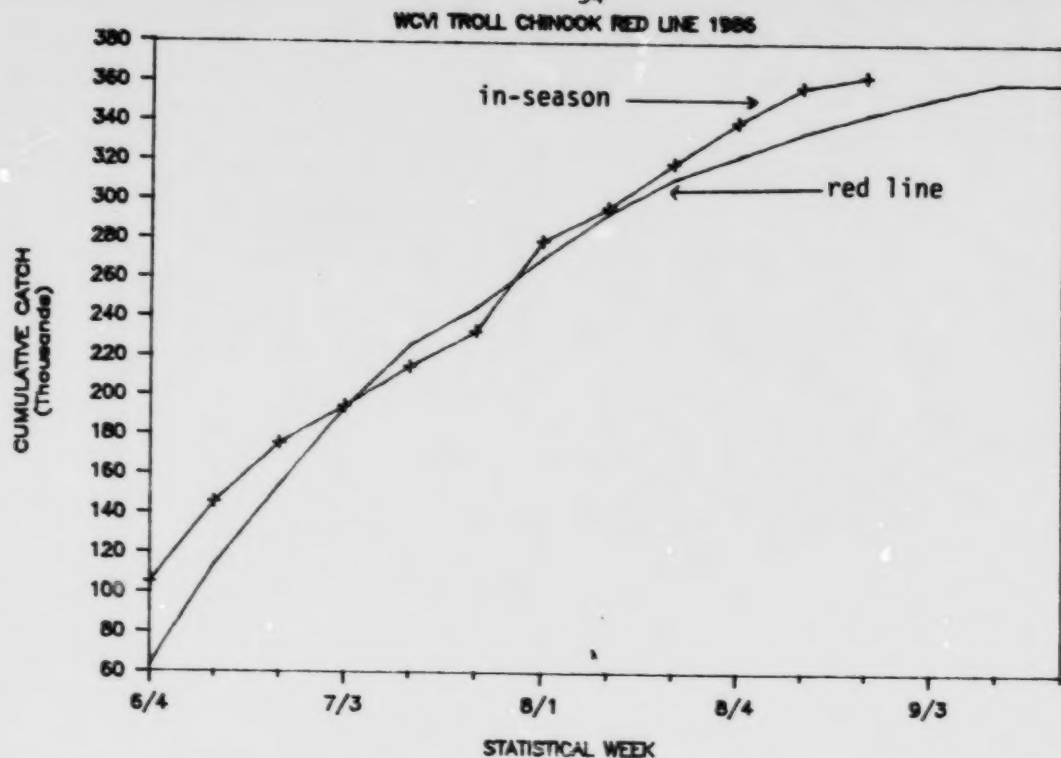


Figure 10. Comparison of cumulative weekly in-season troll catches of chinook with red line catches for WCVI in 1986.

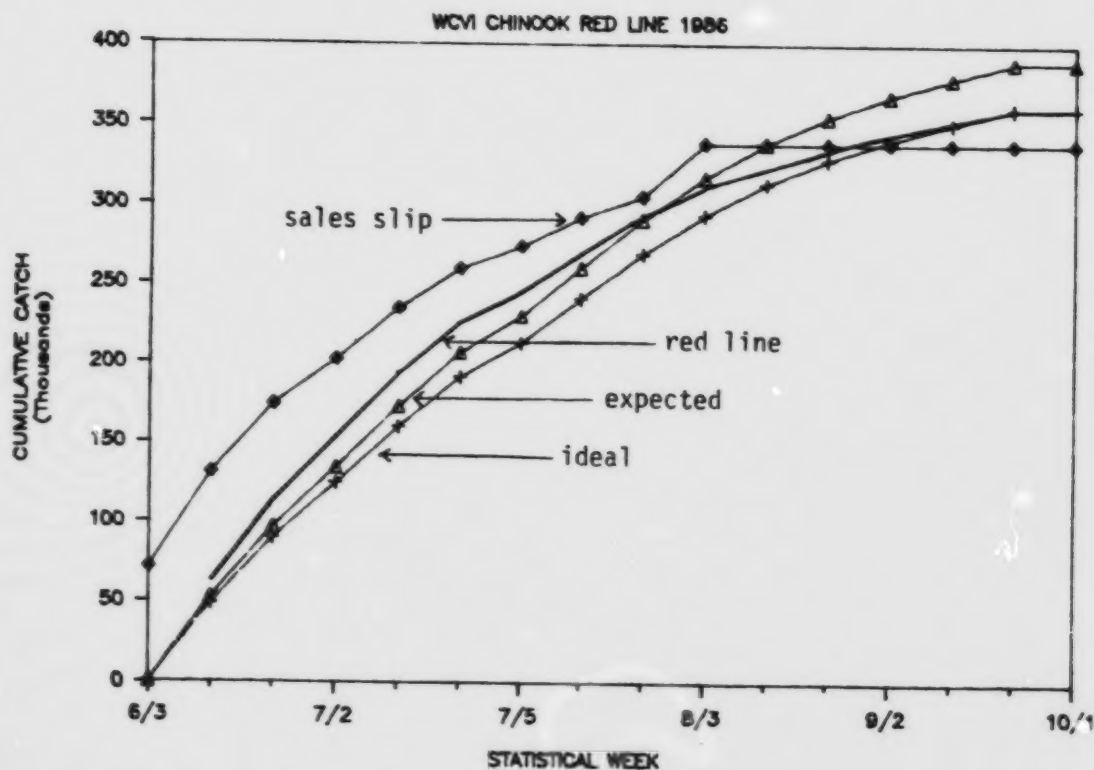


Figure 11. Comparison of cumulative weekly troll catches of chinook (sales slip and ideal) with expected and red line catches for WCVI in 1986.

On August 27, the week 8-3 catch-to-date was reported as 318,600 pieces (Table 7), still 41,400 pieces below the 1986 catch ceiling of 360,000. At this time, the chinook fishery was scheduled to close along with the rest of the South Coast troll fishery at the end of week 8-4. It was feared by some, particularly fishermen, that the 41,400 pieces, reported to be remaining in the allowable catch, could not be taken in the one open week remaining. However, the sales slip estimate of catch showed that after week 8-3 there were actually 55,342 pieces remaining in the chinook allocation and only 33,260 pieces were taken in the final week (Table 12). As a result, the total chinook catch of 337,918, as estimated from sales slip records, fell below the 1986 ceiling of 360,000 pieces by 22,082 fish or 6% (Fig. 11, Table 7).

3.3.2 Coho

The final coho troll catch in 1986 was 2,025,400 pieces as reported by sales slips (Table 12). This catch exceeded the catch ceiling of 1,750,000 pieces by 275,400 or approximately 16% (Table 9, Fig. 12). The overage occurred due to two difficulties with in-season catch monitoring. First, catch-to-date as seen during the 1986 season generally underestimated the sales slip and post-season catches (Tables 9 and 10). The reported catch as given each week by ICMP during the season showed on August 27 that the catch-to-date (week 8-3) was 1,666,000 pieces while post-season results showed that the catch was already over the ceiling and at 1,914,100 pieces (Table 10). Figure 13 indicates that this underestimation of in-season catches was common to each week of the season. However, as shown in Table 13, the real time information suggested that approximately 1.4 weeks of fishery time remained as of statistical week 8-3. Sales slip results show that the final catch of 2,025,400 coho was slightly less than the post-season estimate of 2,153,500 (Table 10).

In addition to underestimating the catches in-season, the ICMP was unable to detect that current daily catches during week 8-4 were substantially higher than averages of daily catches seen in the previous weeks 8-2 and 8-3 (Table 12). Week 8-4 catch, based on the previous two-week average, could have been approximately 58,000 pieces. However, the post-season and final sales slip results showed week 8-4 catches at 239,400 pieces (Table 10) and 331,900 pieces (Table 12) respectively. It was known from experiences in 1985 that in-season coho catch estimates would be low; therefore, bias adjustments were provided from week 8-2 onward (Table 10). However, these adjustments were not sufficient compensation for the degree of underestimation provided by the 1986 ICMP.

3.3.3 Sockeye and Chum

Sockeye catches from sales slip records totalled 1,770,020 (Table 12) which is just over the 1,766,000 allocation to the WCVI troll. This catch, as in other years, was achieved mainly in a two-week period (Fig. 14). Sockeye opened to trolling on July 31 and closed 15 days later on August 15 when it was believed that the troll allocation was taken. Supplementary overflights were conducted to help assess daily sockeye catches during the season. The data from these flights are summarized in Appendix 7.

Chum trolling was also closed on August 15 with a total seasonal catch of 360,647 (Table 12). This sales slip estimate is the highest on record for the WCVI troll fishery and is more than 100,000 pieces higher

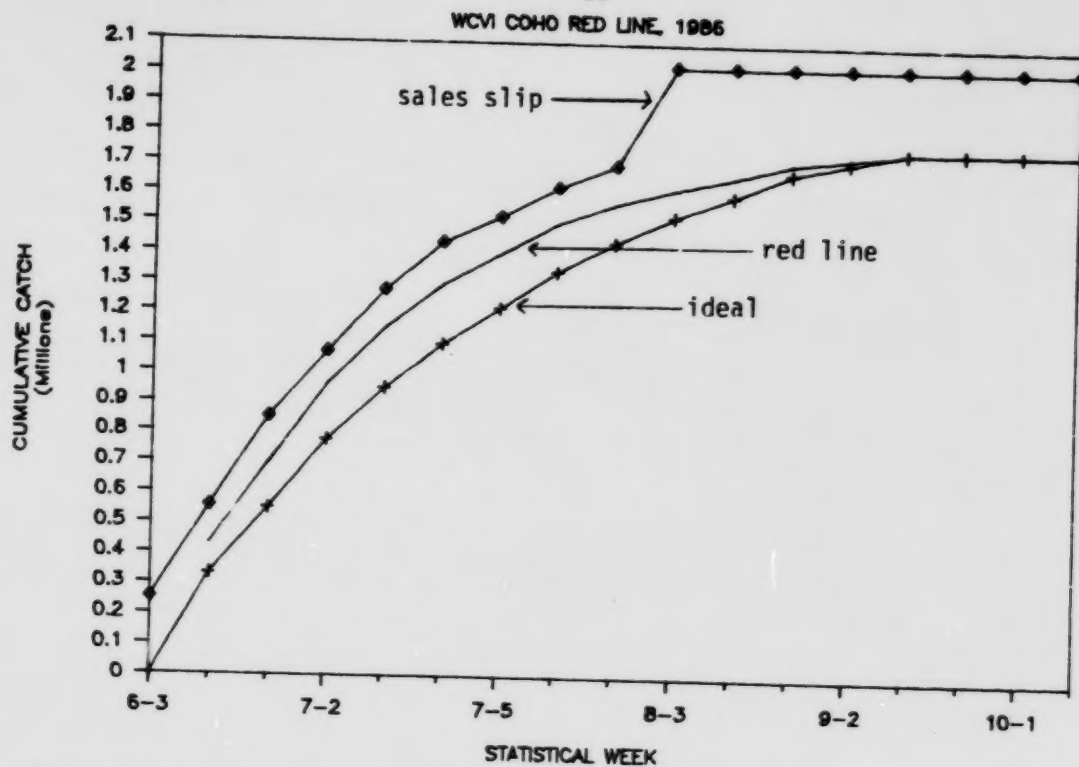


Figure 12. Comparison of cumulative weekly troll catches of coho (sales slip and ideal) with red line catches for WCVI in 1986.

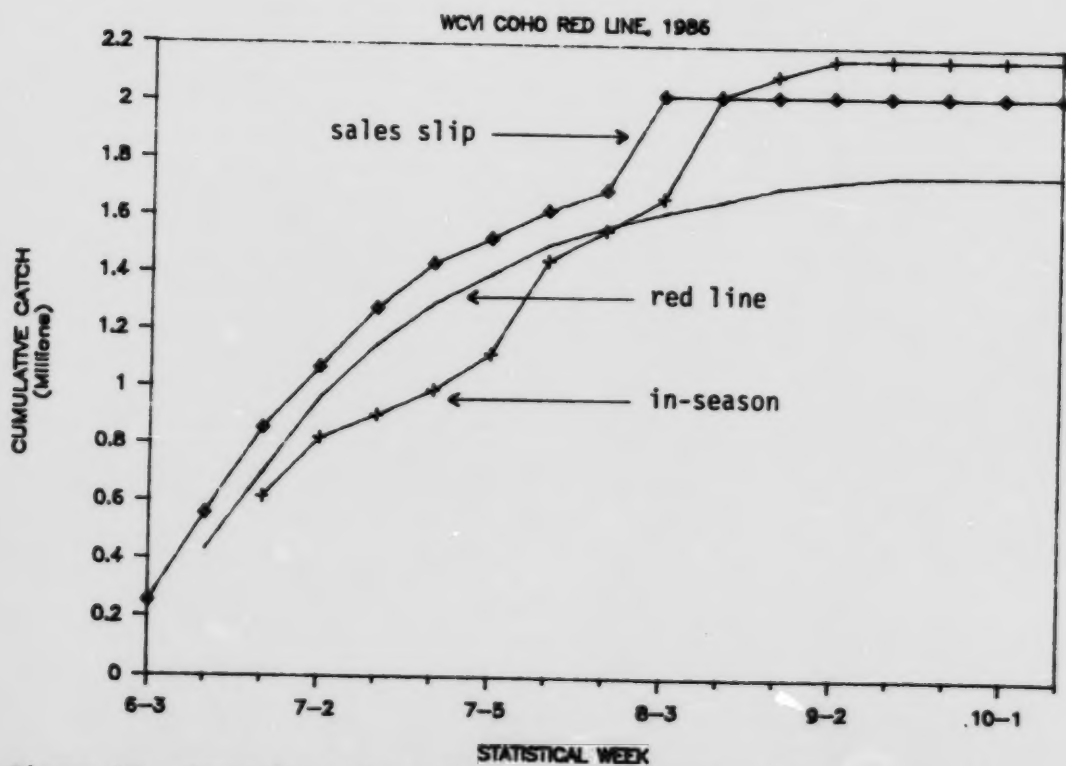


Figure 13. Comparison of cumulative weekly troll catches of coho (sales slip and in-season) with red line catches for WCVI in 1986.

Table 13. Comparison of coho catch estimates and expected remaining fishing time as seen at the time of decision making in-season versus the post-season and sales slip information for WCVI troll fishery, 1986.

Week	In-season estimate TTD	No. pieces remaining	Estimated weeks to fish	Average weekly catch based on last two weeks
Situation as seen on a real time basis during the fishery (Tables 9 and 10).				
7/5	1,117,000	633,000	6.9 weeks	93,000
8/1	1,444,400	305,600	3.0 weeks	101,000
8/2	1,551,900	198,100	3.2 weeks	61,000
8/3	1,666,000	84,000	1.4 weeks	58,000
8/4	2,024,300	0	0	0
Situation as shown by post-season catch estimates (September 18, 1986) (Table 10).				
7/5	1,525,400	224,600	2.0 weeks	120,850
8/1	1,617,300	132,700	1.3 weeks	100,200
8/2	1,685,700	64,300	0.8 weeks	80,150
8/3	1,914,100	0	0	148,400
8/4	2,1153,500	0	0	233,900
Situation as shown by sales slips estimates (April 2, 1987, Table 12).				
7/5	1,432,889	317,111	1.6 weeks	140,200
8/1	1,520,856	229,144	1.1 weeks	112,761
8/2	1,619,806	130,194	0.7 weeks	84,000
8/3	1,693,500	56,500	0	125,000
8/4	2,025,400	0	0	171,300

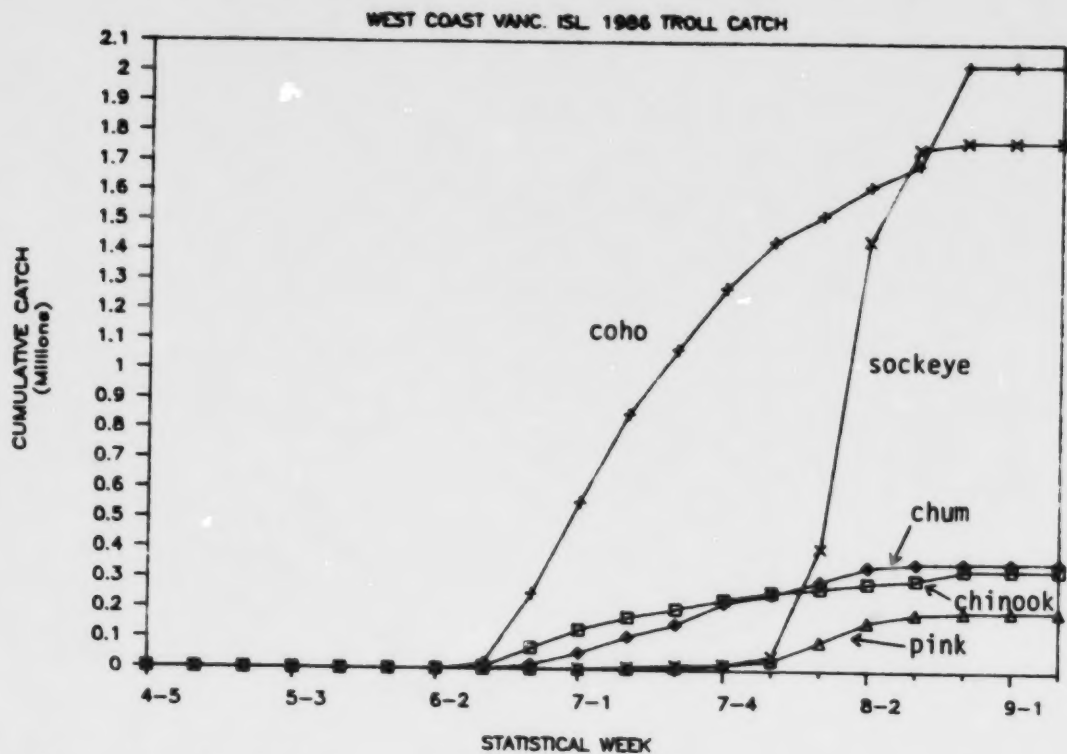


Figure 14. Cumulative weekly troll catches by species from sales slip records for WCVI in 1986; includes Johnstone Strait chum, pink and sockeye catches.

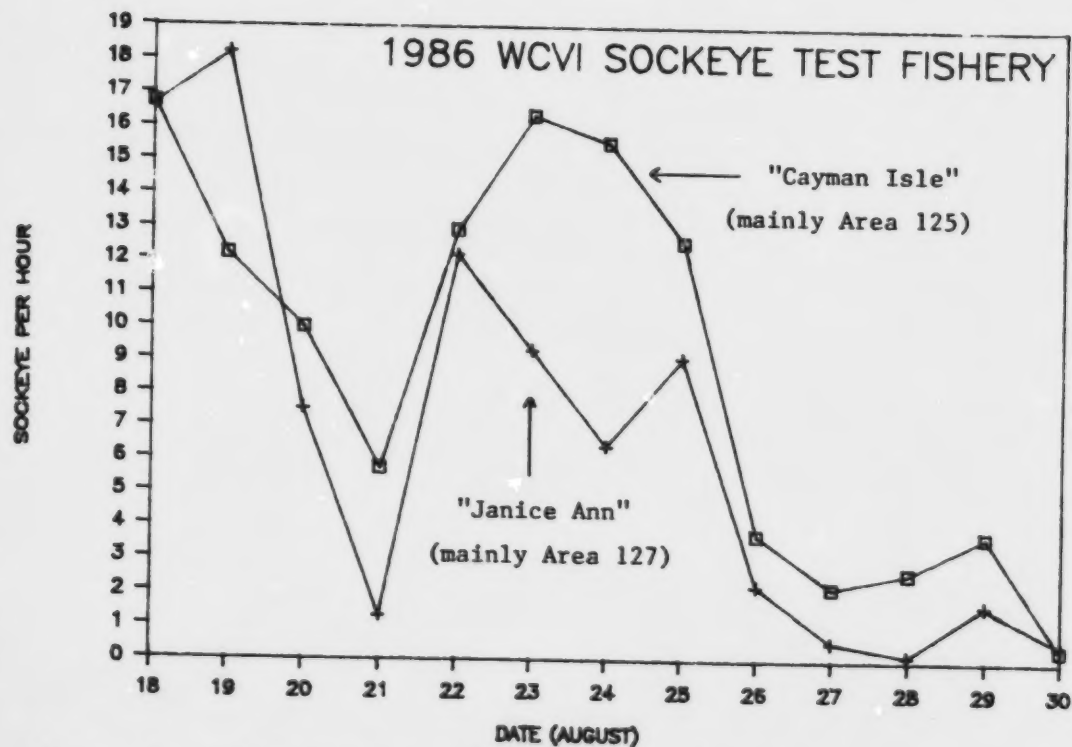


Figure 15. Daily catch per effort (troll hrs), WCVI sockeye test fishery, 1986.

than the previous record set in 1985. In-season catches were believed to be at 273,500 after week 8-1 and 304,000 after closing in week 8-2 (Table 14). However, sales slip records from April 2, 1987 showed a total catch of 360,647 (Table 12) or about 57,000 pieces more.

3.3.4 Pink

Sales slip records showed total pink catch to be 198,093 pieces (Table 12). This is a high catch for the off year cycle of this species, exceeded only twice since 1952 in the even years. Pink fishing was permitted from July 31 until September 5 (Table 11).

3.3.5 Summary

Catch results from sales slip records for the 1986 troll season on WCVI were compared to catch ceilings (Table 5). Chinook catch was 6% below the ceiling level, sockeye catch exceeded the ceiling level by 2%, while coho catch exceeded the ceiling level by 16%. Pink and chum had no catch limits. Coho accounted for the largest WCVI salmon catch in 1986 at 2,025,400 pieces, followed by 1,770,020 sockeye, 360,647 chum, 337,918 chinook and 198,093 pinks. These high catches, including the record high chum catch and near record high pink catch, were achieved in spite of the shortest troll season in the history of this fishery (Table 11). This result is in keeping with the current trend toward higher salmon catch per troll effort (Argue et al. 1987). Cumulative weekly troll catches show that, as with Strait of Georgia (Fig. 4), sockeye catch rates for WCVI were more rapid compared to other species (Fig. 14).

3.4 TROLL TEST FISHING FOR WCVI

Two new troll test fishing programs were conducted in 1986. Sockeye test fishing, which had not been conducted previously above the 49th parallel, was initiated in Management Areas 125 to 127. Catch sampling was also conducted on chum salmon in the Northwest Coast of Vancouver Island and included electrophoretic analysis for racial composition. Preliminary results for both programs are discussed below.

3.4.1 Sockeye Test Fishing

A troll test fishery was conducted in August north of 49° N (Figs. 6 and 7) to provide information regarding run strength and timing of Adams sockeye. Two day-boats under charter to the Pacific Salmon Commission were already fishing south of the 49th parallel. Bids for the fishing charter were received from six trollers and two were selected. The "Janice Anne" fished mainly in Statistical Area 127 while the "Cayman Isle" fished mainly in Statistical Area 125, both for a 13-day period from August 18 to 30. Test fishing catches for each day are summarized in Table 15. During the last few days of the charter, sockeye catches dropped off dramatically for both vessels indicating the run had passed the test fishing area. Sockeye scales (one scale per sockeye up to a maximum of 120 fish each day) were analyzed by the Pacific Salmon Commission to determine the racial origin. At the time of writing, only 55 scales of the 1,818 taken during the test fishery had been analyzed for racial and age composition. The analyzed sample came from the August 20 and 21 test fishery in Area 127. The sample consisted entirely of age 4 fish, 68% of which were of Adams/L. Shuswap origin (Table 16).

Table 14. In-season chum troll catch estimation for WCVI as given each week during the fishery in 1986 (catch is cumulative in pieces).^a

In-season estimates as reported after	Statistical Week Of Catch													
	each week.	6/3	6/4	7/1	7/2	7/3	7/4	7/5	8/1	8/2	8/3	8/4	9/1	9/2
7/1		6,000	29,000	29,100										
7/2		5,400	29,900	30,900	29,800									
7/3		5,400	29,900	30,700	28,500	30,700								
7/4		5,400	29,900	30,700	29,000	49,600	41,000							
7/5			35,400 ^b	30,700	29,000	49,800	45,900	36,500						
8/1			35,400 ^b	30,700	29,000	49,800	45,400	40,100	43,100					
8/2			39,000 ^b	46,500	51,000	49,300	32,000	43,000	43,200	22,200				
8/3			39,300 ^b	46,800	51,600	51,800	35,200	30,500	42,700	14,600	0			
8/4			39,400 ^b					222,900 ^c	43,900	15,400	0	0		
9/1			39,400 ^b					223,700 ^c	45,200	19,100	0	0	0	
9/2			41,500 ^b					239,100 ^c	48,100	20,500	0	0	0	0
TTD (A) ^d			35,000	64,100	96,000	125,200	185,600	227,300	273,500	304,000	312,500	321,600	327,400	349,200
TTD (B) ^e			41,500	88,300	139,900	191,700	226,900	239,100	287,200	307,700				

^aData Source: Bulletins 1 through 11 In-Season Catch Estimation Program.

^bEstimate for all of June.

^cEstimate for all of July.

^dTotal to date as seen on a real time basis during the fishery.

^eTotal to date as given on the last week (9/2) September 18, 1986.

Table 15. Daily sockeye catches for Northwest Coast of Vancouver Island troll test fishery in 1986.

VESSEL: JANICE ANNE

DATE	POSITION	HOURS FISHED	SOCKEYE	COHO	PINK	CHUM	CHINOOK
AUG 18	AREA 125	11.0	183	3	0	1	0
AUG 19	AREA 125	8.3	150	0	0	1	0
AUG 20	AREA 127	7.2	54	2	1	0	4
AUG 21	AREA 127	8.5	11	0	0	1	2
AUG 22	AREA 127	12.5	152	1	2	10	0
AUG 23	AREA 127	12.8	119	0	0	22	10
AUG 24	AREA 127	13.0	83	13	1	3	8
AUG 25	AREA 127	13.5	122	11	1	6	3
AUG 26	AREA 127	14.0	31	7	0	6	1
AUG 27	AREA 127	5.5	3	10	0	0	1
AUG 28	AREAS 127 & 126	13.4	2	8	0	3	2
AUG 29	AREAS 126 & 125	13.8	23	7	0	1	0
AUG 30	AREA 124	4.0	2	2	0	0	2
TOTALS		137.6	935	64	5	54	33

VESSEL: CAYMAN ISLE

DATE	POSITION	HOURS FISHED	SOCKEYE	COHO	PINK	CHUM	CHINOOK
AUG 18	AREA 125	11.1	186	5	0	1	1
AUG 19	AREA 125	14.5	176	3	0	3	1
AUG 20	AREA 125	5.4	54	2	0	0	2
AUG 21	AREA 125	14.0	80	10	1	0	3
AUG 22	AREA 125	13.3	171	5	0	0	7
AUG 23	AREA 125	9.0	147	6	0	0	6
AUG 24	AREA 125	9.1	141	3	0	0	1
AUG 25	AREA 125	14.3	180	24	0	0	8
AUG 26	AREA 125	14.3	53	21	0	0	3
AUG 27	AREA 124	6.0	13	2	0	0	3
AUG 28	AREAS 124 & 125	13.5	35	11	0	0	9
AUG 29	AREAS 124 & 125	14.3	53	2	0	0	12
AUG 30	AREA 124	5.2	2	3	0	0	1
TOTALS		143.9	1291	97	1	4	57

Table 16. Racial origin of sockeye from Northwest Coast of Vancouver Island troll test fishery in Area 127, August 20 and 21, 1986.^a

Stock Origin	% Sample Composition
Chilko R.	2
Stellako	1
Birkenhead	13
Adams/L. Shuswap	68
Weaver Grp.	12
Cultus Grp.	4

^aMore results will be available when the spawning ground scale samples are analyzed.

Table 17. Racial origin of sockeye from sample taken in Area 126, August 4, 1986.

Stock Origin	% Sample Composition	Stock Origin	% Sample Composition
Non-Fraser	3	Seymour/Scotch Cr.	1
Chilko R.	8	Horsefly/L. Stuart	2
Stellako	3	Birkenhead	5
Adams/L. Shushwap	72	Weaver Grp.	6

On August 4, 90 scale samples were also taken from fish caught by the "Lyra" in Area 126. Three of the fish were age 5 while the remaining 87 were age 4. Majority of the sample (72%) were of the Adams/L. Shuswap racial origin (Table 17).

Catch per unit effort for the two vessels "Janice Ann" and "Cayman Isle" fishing in different areas showed remarkably similar trends (Fig. 15). Both vessels showed two CPUE peaks, one in mid- and one in later August, which suggests the passing of different groups of sockeye. When racial analysis from all scale samples collected becomes available, this possibility can be examined further.

3.4.2 Chum Catch Sampling

A program to collect electrophoretic samples from the WCVI troll fishery was implemented in the 1986 season. Chum salmon were purchased from day trollers landing at Winter Harbour. Heart, liver and muscle tissues were collected, stored on dry ice and shipped to a private firm for electrophoretic analysis. All fish were caught in Statistical Area 127 and were freshly dead when frozen.

The electrophoretic results were analyzed at the Pacific Biological Station using techniques developed there to estimate stock composition (Wood et al. 1987). The data were aggregated into six groups for simplicity: Queen Charlotte Islands, North and Central Coast, WCVI, Johnstone/Georgia Straits, Fraser River and Washington State.

Briefly, the majority (48%) of the sampled WCVI chum troll catch was composed of stocks from the North and Central Coast. Of moderate importance were Fraser stocks (22%) and Queen Charlotte Island stocks (23%). Minor contribution to the catch came from Johnstone Strait/Georgia Strait stocks (5%), and WCVI and U.S. stocks which accounted for approximately 1% each. A more complete and final report on the chum catch sampling program is expected in the near future (Yreeling et al. 1987).

3.5 TROLL MODEL FOR WCVI

In the winter of 1986, a simulation model was developed to assist with the evaluation of various WCVI troll management options (see Appendix 6 for details). These options included time and area closures, non-retention fisheries, varying season length and timing, size limits and troll gear restrictions. The model was also designed to predict the rate of catch and escapements (escapements to other fisheries rather than spawning escapements) that would result from various management actions. This model is still considered to be in the developmental stages and had only limited application in 1986. The results from initial use of the troll model indicate that it can be a beneficial tool in the co-management process as a background for comparison of various pre-season fishing plan proposals (Appendix 5). In addition, where catch ceilings are involved (as with chinook for example) the model can be used to predict the rate of catch (Section 3.2.1). Figure 8 shows the "expected" chinook catch as generated from pre-season simulations using the troll model.

4.0 JOHNSTONE STRAIT

Fishing in Johnstone Strait (Areas 111, 11-13) is mainly by net gear. Therefore, as in previous years, troll management actions in 1986 were dictated by concerns for net species and net fleet activities. Consequently, Johnstone Strait trollers were not assigned catch ceilings, but rather had their Johnstone Strait catches assigned to other catch ceilings. For example, chinook caught in Areas 111 and 11 were assigned to the North Coast catch ceiling, while chinook caught in Area 13 were assigned to the Strait of Georgia catch ceiling. Assignment of species to catch ceilings was as follows:

<u>Stat. Area</u>	<u>Chinook</u>	<u>Coho</u>	<u>Pink</u>	<u>Sockeye</u>	<u>Chum</u>
111, 11	North Coast	No ceiling	WCVI	WCVI	WCVI
12	No ceiling	No ceiling	WCVI	WCVI	WCVI
13	Georgia Strait	No ceiling	Georgia Strait	Georgia Strait	No ceiling

Table 18 summarizes the management actions taken in 1986. Trolling was permitted in Johnstone Strait from June 20 to September 19. Catch results from sales slip records are shown in Table 19. Coho accounted for the largest salmon catch in 1986 at 407,608 pieces, followed by 102,388 chum, 52,045 sockeye, 30,661 pinks and 3,662 chinook. Cumulative weekly troll catches showed that coho catches accumulated much faster than other species in 1986 (Fig. 16).

5.0 SUMMARY

In 1986 the troll fishery in southern B.C. was intensively managed during the season for the second year in a row. This was largely a result of the terms of the Pacific Salmon Treaty, ratified by Canada and the United States early in 1985. DFO outlined management actions in a series of plans that were released to industry prior to and during the season. Management actions included reduction of trolling areas, closures, and periods of non-retention for certain salmon species and fisheries. The purpose of most of these actions was to keep troll harvests within specified levels of catch (catch ceilings) over the duration of the troll season in three areas: Strait of Georgia, West Coast of Vancouver Island and Johnstone Strait.

In Georgia Strait, trolling began 10 days earlier (June 20) than in recent years and some portions of the Gulf were open in October for the first time since 1983. In contrast, the troll season on the WCVI (June 20 - August 30) was the shortest in the history of that fishery. However, overall salmon catches did not decline. This result is in keeping with the current trend toward higher salmon catch per troll effort. The troll season in the Johnstone Strait continued from June 20 to September 19. Catch ceilings for chinook and sockeye were approached but not exceeded on the WCVI and in the Strait of Georgia. The catch ceiling for coho on the WCVI was exceeded by 16%.

Table 18. Summary of 1986 Johnstone Strait troll fishery management actions.

PERIOD	STAT. AREA	MANAGEMENT ACTIONS			MANAGEMENT AREAS OPEN
		Species Open	Action	Purpose	
June 20 to July 30	11	Chinook and coho	Fishery opens with barbed hooks permitted.	Commence troll season in concert with WCVI and Gulf.	11-1, 11-2, 7 days/week.
	12	Chinook and coho	Fishery opens with barbed hooks permitted in Deserters group.	Commence troll season in concert with WCVI and Gulf.	12-10, 12-13, 7 days/week.
July 31 to August 2	11	All salmon	Sockeye, chum and pink retention permitted.	Harvest allocation to troll.	11-1, 11-2, 7 days/week.
	12	All salmon	Fishery opens with barbed hooks permitted in Deserters group.	Commence troll season in concert with WCVI and Gulf.	12-10, 12-13, 7 days/week.
August 3 to August 9	11	All salmon	Continue all species fishery.	Harvest allocation to troll.	11-1, 11-2, 7 days/week.
	12	All salmon	Open net fishery areas to trolling.	Allow greater access to sockeye and chum.	12-1, 12-3, 12-4, a portion of 12-5, 12-8, 12-9, 12-11, 12-12 open 14 days. 12-10, 12-13 open 7 days/week.
August 10 to August 14	11	All salmon	Continue all species fishery.	Harvest allocation to troll.	11-1, 11-2, 7 days/week.
	12	All salmon	Open net fishery areas to trolling.	Allow greater access to sockeye and chum.	12-1, 12-3, 12-4, a portion of 12-5, 12-8, 12-9, 12-11, 12-12 open 14 days. 12-10, 12-13 open 7 days/week.

(cont'd)

Table 18 (Cont'd)

PERIOD	STAT. AREA	MANAGEMENT ACTIONS			MANAGEMENT AREAS OPEN
		Species Open	Action	Purpose	
August 14 to August 29	11	Chinook, coho, pink	Chum and sockeye retention prohibited.	Allocation of species achieved.	11-1, 11-2.
	12	Chinook, coho, pink	Chum and sockeye retention prohibited - net fishery areas closed to trolling.	allocation of species achieved.	12-10, 12-13, 7 days/ week.
August 30 to September 4	11	Chinook, coho, pink	Closed a portion of 11-12.		11-1 and a portion of 11-2.
	12	Chinook, coho, pink	Chum and sockeye retention prohibited - net areas closed to trolling.	Allocation of species taken.	12-10, 12-13, 7 days/ week.
September 5 to September 15	11	NONE	Closed for balance of season.	Allocation of chinook taken.	CLOSED
	12	Chinook, coho, pink	Chum and sockeye retention prohibited - net areas closed to trolling.	Allocation of species taken.	12-10, 12-13, 7 days/ week.
September 16 to September 18	11		CLOSED FOR SEASON		
	12	All salmon	Open to trolliers with inside licences only.	Harvest additional sockeye and chinook.	12-1, 12-3, 12-4, a portion of 12-5, 12-8.
September 19			CLOSED FOR BALANCE OF SEASON		

Table 19. Weekly troll catches and days fishing by species from sales slip records for Johnstone Strait in 1986.^a

WEEK	WEEKLY CATCH					TROLL DAYS	CUMULATIVE CATCH				
	CHINOOK	COHO	CHUM	PINK	SOCKEYE		CHINOOK	COHO	CHUM	PINK	SOCKEYE
6-3	0	794	10	0	0	11	0	794	10	0	0
6-4	299	40539	669	15	2	568	299	49333	679	15	2
7-1	292	67916	5057	220	27	569	591	117249	5736	235	29
7-2	661	78910	17397	419	306	749	1252	196159	23133	654	335
7-3	582	58147	12233	3201	854	754	1834	254306	35366	3855	1189
7-4	930	80349	44416	8034	2884	1503	2764	334655	79782	11889	4073
7-5	199	25782	14998	7465	2875	862	2963	360437	94780	19354	6948
8-1	255	8026	2203	4146	6163	333	3218	368463	96983	23500	13111
8-2	138	12481	4018	4173	27573	359	3356	380944	101001	27673	40684
8-3	188	2635	994	1883	9646	182	3544	383579	101995	29556	50330
8-4	112	12009	196	478	1370	543	3656	395588	102191	30034	51700
9-1	0	9006	99	401	345	527	3656	404594	102290	30435	52045
9-2	0	2885	47	220	0	95	3656	407479	102337	30655	52045
9-3	2	53	1	0	0	1	3658	407532	102338	30655	52045
9-4	4	76	50	6	0	5	3662	407608	102388	30661	52045
10-1	0	0	0	0	0	0	3662	407608	102388	30661	52045
TOTAL	3662	407608	102388	30661	52045	7061					

^aCatch and troll days are from sales slips processed as of March 20, 1987. Data are for Statistical Areas 11, 12 and 111 except for chinook catch which is for Area 12 only. Chum, pink and sockeye catches allocated to West Coast Vancouver Island statistics. Sales slip estimates are from Wong (1983) database and are not adjusted to reflect times of openings and closings. The appearance of catches before openings (see Table 18 for dates) may be the result of test fisheries and of catches made in other areas that are open. The appearance of catches after closings (see Table 18 for dates) is the result of assignment of the catch to the date of landing.

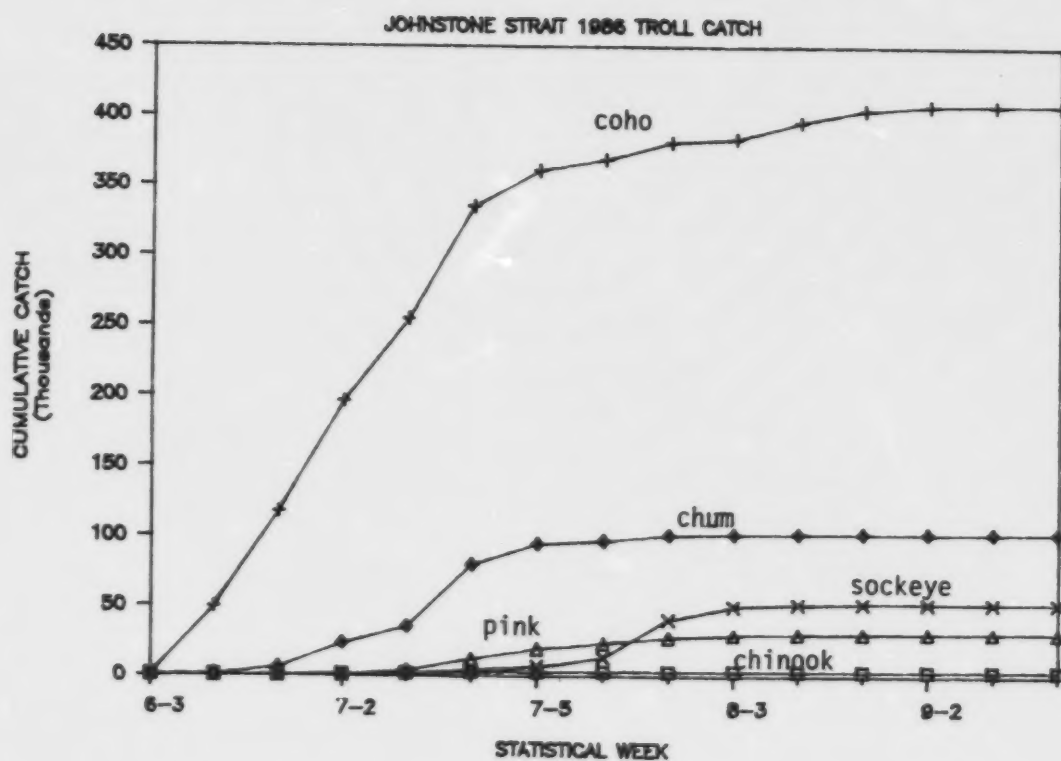


Figure 16. Cumulative weekly troll catches by species from sales slip records for Johnstone Strait in 1986; chinook catch is for Area 12 only.

Difficulties in predicting run strengths (sockeye) and in obtaining accurate in-season catch estimates were again experienced in 1986. Improvement of in-season management of this fishery will require better estimates of in-season catches and more accurate forecasts of run strength.

6.0 ACKNOWLEDGEMENTS

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7.0 LITERATURE CITED

- Argue, A.W., R. Hilborn, R.M. Peterman, M.J. Staley and C.J. Walters. 1983. Strait of Georgia chinook and coho fishery. Can. Bull. Fish. Aquat. Sci. 211: 91 p.
- Argue, A.W., M.P. Shepard, T.F. Shardlow and A.D. Anderson. 1987. Review of salmon troll fisheries in southern British Columbia. Can. Tech. Rep. Fish. Aquat. Sci. 1502: 150 p.
- Carter, E.W., L.A. Lapi and E.A.R. Ball. 1986. Catch, size, and age of chinook salmon taken in the Strait of Georgia troll fishery in 1984 and comparisons with 1983 data. Can. Tech. Rep. Fish. Aquat. Sci. 1456: 67 p.
- English, K.K., W.J. Gazey, T.F. Shardlow and M. Labelle. 1988. Development of troll fishery management models for southern British Columbia. Can. Tech. Rep. Fish. Aquat. Sci. 1526: 79 p.
- Gazey, W.J., K.K. English and M.J. Staley. MS 1987. South Coast Management Model: Second Ed., Unpubl. Rep. for Dept. Fish. Oceans, Canada. 68 p. + Appendices.
- Jordan, F.P. and E.W. Carter. 1986. 1985 West Coast troll log program. Can. Data Rep. Fish. Aquat. Sci. 587: 45 p.
- Milne, D.J. 1964. The chinook and coho salmon fisheries of British Columbia. Bull. Fish. Res. Bd. Canada 142: 46 p.
- Shardlow, T.F., A.D. Anderson and A.W. Argue. 1986. Review of 1985 south coast salmon troll fisheries. Can. MS Rep. Fish. Aquat. Sci. 1895: 68 p.

- Shardlow, T.F., T.G. Hoyt, T.A. Calvin, G.E. Gillespie and K.K. English. MS 1988. Strait of Georgia creel survey sport fishery statistics, 1983. Can. MS Rep. Fish. Aquat. Sci. 1872: (in prep).
- Webb, T.M., K.K. English and W.J. Gazey. 1983. In-season chinook catch estimation. Rep. prep. under Dept. Supply Serv. contract to ESSA Ltd. and LGL Ltd. for Field Serv. Br., Dept. Fish. Oceans. 79 p.
- Wong, F.Y.C. 1983. Historical salmon commercial catch data system of the Fisheries Research Branch, Department of Fisheries and Oceans, Pacific Region. Can. Tech. Rep. Fish. Aquat. Sci. 1156: 94 p.
- Wood, C.C., S. McKinnel, T.J. Mulligan and D.A. Fournier. 1987. Stock identification with the maximum - likelihood mixture model: sensitivity analysis and application to complex problems. Can. J. Fish. Aquat. Sci. 44: 866-881.
- Vreeling, M.C., L. Hop Wo, A.P. Gould, W. Luedke, S.R. Heizer and T.D. Beacham. 1987. Biochemical Genetic Stock Identification of Chum Salmon in Southern B.C., 1986. Can. Data Rep. Fish. Aquat. Sci. No. 634: 19p.

APPENDIX 1

**NEWS RELEASES AND COMMUNICATIONS
REGARDING 1986 SALMON ALLOCATIONS**





Fisheries
and Oceans

Pêches
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News Release Communiqué

NR-PR-86-10

FOR IMMEDIATE RELEASE
June 27, 1986

GEORGIA STRAIT CHINOOK SALMON ALLOCATION SET

VANCOUVER -- A 1986 total allowable catch of 263,000 chinook salmon for the Gulf of Georgia was announced today by the Honourable Tom Siddon, Minister of Fisheries and Oceans.

The 263,000 total represents about a four per cent reduction from the 275,000 ceiling established under the Canada-United States Pacific Salmon Treaty of March, 1985.

The small reduction was made necessary, Mr. Siddon said, to ensure that Canada gets back on schedule in the chinook rebuilding program to meet its obligations under the Canada-U.S. treaty.

The recreational fishery will be allowed 215,000 chinook and Gulf trollers 48,000 in this year's allocation plan. The reduction was applied to the total allowable catches of both sectors.

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News Release Communiqué

NR-PR-086-04A

FOR IMMEDIATE RELEASE

Friday, February 14, 1986

1986 Pacific Salmon Allocation Plan

VANCOUVER -- Pacific salmon allocations for the 1986 fishing season will reflect historical harvest patterns with some minor alterations.

"Specific area management plans are still being discussed with departmental officials and local advisory groups," Fisheries and Oceans Minister Tom Siddon said today.

The Minister's allocation decision was made after full consideration of the recommendations of the Minister's Advisory Council.

Allocations on the north coast will generally reflect the catch levels of the various gear types during the brood year (1982), with the exception of obligations made as a result of the Canada-United States Pacific Salmon Treaty.

On the south coast, the Minister's Advisory Council recommended, for Fraser-bound sockeye, allocations of 22.8 per cent for trollers, 29.7 per cent for gillnetters and 47.5 per cent for seiners. However, trollers made representations for 33 per cent of the Fraser sockeye allocation.

"I sympathize with the situation of the Gulf trollers," the Minister said. "I have decided to alter slightly the MAC recommendations for Fraser-bound sockeye to more closely recognize

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the reality and historical involvement of the Gulf trollers. Therefore I have decided to allocate, for 1986, an additional 100,000 sockeye to Gulf trollers. With this increase of 100,000 sockeye, the overall troll share of Fraser-bound sockeye will reach 24 per cent."

The Minister has decided to maintain chinook allocations in the Georgia Strait at the same levels as 1985. The combined allowable catch in the Gulf of Georgia under the Canada-U.S. Treaty is 275,000. Last year, the sport fish share was 225,000 and the troll share was 50,000 chinook. This year, Gulf trollers requested 45 per cent of the available chinook catch.

"I have taken my advisory council's recommendations very seriously in deciding upon this year's fishing allocations," Mr. Siddon said. "I will be seeking the council's advice should adjustments become necessary during the fishing season."

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Backgrounder Documentation

A

Fact Sheet

1986 Pacific Salmon Allocation Projections

The Minister's Advisory Council (MAC) is comprised of commercial and sport representatives from the fish resource user groups. Each year MAC makes recommendations to the Minister on salmon allocations for all fishing sectors. This year's salmon allocations have been made initially by salmon run, if origin is identifiable; next by region, if stocks are from more than one river system but not necessarily from the same area; and finally, by area.

Overall, it is anticipated that the 1986 salmon fishery will be better than average, with a total catch of 70,000-80,000 metric tonnes forecast. Particular bright spots include sockeye in the Fraser, where the Adams River run will feature prominently in the catch. Projections are for a Canadian catch of 6,900,000 sockeye from this run, an increase of 15 per cent over what would have been allowed without the recently signed Canada-United States Treaty. Other bright spots include sockeye and pink fisheries in the north and central coast. Fisheries in the south for chums and pinks will provide only limited opportunities for directed fisheries, except for some enhanced chums. Chinook fisheries will continue at low levels to permit stock rebuilding under the Treaty. Although natural coho returns will be average, enhanced coho will be available to support an active sport fishery in 1986.

Traditional fishing patterns are being followed as closely as possible in the process. Net fishing plans are designed for allocation of the major stock in the area.

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Every effort is being made to maintain current data on catches so that quick management decisions can be made to balance shares within that run. Allocations cannot be made up in other runs, regions or areas unless MAC or the area regional board has been consulted.

Any decisions on non-predetermined allocations throughout the season will take into account historical performance by the fishing gears on that run, historical conservation efforts made by all gear types in rebuilding that run, safe harvesting methods and the base years or criteria that have been developed by MAC.

ALLOCATION PLAN - 1986SOUTH COAST

FRASER BOUND SOCKEYE - 4 cycle years used (1982, 1978, 1974, 1970)

Members of the Minister's Advisory Council have recommended, for south coast Areas excluding Area 23 and with the addition of Area 2W, 29.7% Gillnets /47.5% Seine/ 22.8% Troll. Of the 22.8% Troll, 10% are to be allocated (2.3% total) to Inside Trollers with the rest to the Outside Trollers. The Minister has accepted this recommendation except that an additional 100,000 pieces are to be reallocated to the Gulf Trollers.

BARKLEY SOUND SOCKEYE - 60% Seine/40% Gillnets split as in the past.

GEORGIA STRAIT CHINOOK: 225,000 pieces allocated to the sport fishery and 50,000 to Gulf Trollers.

CHUMS - Areas 12 and 13 managed as in the past.

South coast Areas: 50/50 net fleet split (based on forecasts) to be maintained. If DFO predicts larger runs than in its September forecasts, then a meeting should be convened between the South Coast Advisory Board and the Minister's Advisory Council to discuss the options.

Separate openings with Gillnets to start first.

Simultaneous openings in various areas, if possible, to split the fleet.

Balance of catch to be maintained as closely as possible to the total allowable catch as set by DFO with an imbalance to be corrected by additional openings to the gear that is behind.

Earlier Gillnet openings on the west coast of Vancouver Island (Areas 20 & 21).

Area 29 and Bute Inlet - Gillnets only.

Troll catches monitored to ascertain if the Troll fleet is targeting on chums when the net fleet is closed, and a limit for the Troll catch to be based on historic levels of incidental catches.

PACIFIC SALMON COMMISSION

ESTABLISHED BY A TREATY BETWEEN CANADA
AND THE UNITED STATES OF AMERICA

File No.

NANAIMO, B.C.

P.O. BOX 1318
STATION A
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March 7, 1986

The Honourable Joe Clark
Secretary of State for External Affairs
Ottawa, Ontario
K1A 0G2

Dear Sir:

I have the honor to report to you on understandings which have been reached by the Pacific Salmon Commission and to recommend changes in Annex IV of the Pacific Salmon Treaty, which entered into force in 1985.

In accordance with Article XIII, Paragraph 2 of the Treaty, the Commission recommends the following amendments to Annex IV, which pursuant to Article XIII, paragraph 3 may be implemented through an exchange of notes between the Governments. The Commission expects that the relevant management agencies will manage fisheries under their responsibility in the recommended manner during the 1986 fishing season. The Commission recommends that an exchange of notes occur implementing these proposals as soon as possible.

1. Chapter 2, paragraph 3 (b) and (c) shall be replaced by the following:

"3(b). in 1986 only, the following management units in Area 1 will remain open to pink salmon troll fishing until a total Area 1 troll catch of 600,000 pink salmon has been taken: 1-1, 1-2, 1-7, 1-3, 1-5 and 101-7;

3(c). in consideration of the adjustment made in the southern portion of Area 1, the pink salmon troll fishery in the most northern portion of Area 1 in Management Units 101-4, 101-8, and 101-3 north of 54°35' N. and 103 north of 54°53' N. will close to pink salmon trolling when the 1986 Area 1 pink troll catch reaches 100,000; and

3(d). in addition, when the 1986 Area 1 pink troll fishery catch reaches 290,000 fish Canada will also close Management Units 101-1, 101-2, 101-3, 101-5, 101-9, 101-6 and 101-10 to pink salmon trolling."

2. Chapter 5, paragraph 3, shall be amended as follows:

"1985" shall be changed to "1986".

3. Chapter 6. Add a new paragraph 3 as follows:

"3. Implement the following regimes for 1986 only, which are not designed to address long term management objectives of the parties:

- (a) Canada shall conduct their Johnstone Strait, Georgia Strait and Fraser River chum fisheries consistent with the clockwork management scheme developed for 1984 and 1985, except as modified herein.
- (b) The United States will conduct Area 7 and 7A chum fisheries as follows:
 - (i) The following catch ceilings for United States fisheries will be implemented:

Allowable Total Harvest Rate	Total Stock Size	Area 7 and 7A Ceiling
10 percent	< 2.6 million	10 thousand
≥ 20 percent	≥ 2.6 million	80 thousand

It is understood that of the 80 thousand it is expected that 60 thousand chum of Fraser River origin will be harvested.

It is also understood that total stock size refers to estimated preseason and inseason update of chum salmon passing through Johnstone Strait, Georgia Strait, Fraser River and Areas 7 and 7A calculated according to the clockwork approach.

- (ii) If the Fraser River component of the total run is reduced from the current preseason forecast by the inseason updates to the extent that, despite a total run size of greater than 2.6 million, the Fraser River component of the total run could not support a fishery and meet a minimum escapement goal, and Canada restricts fisheries in Johnstone Strait and the Fraser River to remain below a 10 percent exploitation rate on Fraser River chum, then United States Areas 7 and 7A fisheries would be limited to a catch of 10,000 chum.
- (c) The fishery management plan described herein is predicated on the following assumptions:
 - (i) All catch of Fraser River origin chum taken in Johnstone Strait, Georgia Strait, Fraser River and Areas 7 and 7A fisheries is included in the allowable total harvest rate.

- (ii) If there is an adjustment to the run size estimates, all three components of the run (Canadian enhanced and natural, and United States stocks) will be adjusted in proportion to the change from the preseason forecast until sufficient GSI data is available to more accurately apportion the total run size.
- (iii) The escapement targets are those specified in the 1984 and 1985 clockwork management plan. All fish not harvested at the allowable harvest rate under the plan will be allowed to escape and spawn.
- (d) If during subsequent domestic consultation on the 1986 fishing plan Canadian chum salmon managers decide to make deviations from the general approach or the specific assumptions outlined in paragraph (c), the Southern Panel Chair and Vice-Chair will be notified and a decision made as to the need for convening a Southern Panel meeting to develop appropriate changes to the management plan specified in paragraph (b).
- (e) The United States fisheries will be managed in a manner that, as far as practicable:
 - (i) spreads the impact on all portions of the Fraser run,
 - (ii) maintains a traditional proportion of effort and catch between Areas 7 and 7A, and avoids concentrations of effort along the boundary."

The Commission has also reached the following understandings as to the implementation of the Pacific Salmon Treaty.

COHO

The 1985 fishery regimes described in Annex IV, Chapter 5 of the Treaty shall be continued in 1986. The management plans and fishing regimes implemented in 1985, including U.S. management Areas 7, 7A and the Strait of Juan de Fuca and Canadian management Area 20, shall remain the basis for the 1986 management plans. It is understood that the Government of Canada intends to harvest 1.75 million coho in the West Coast of Vancouver Island troll fishery in 1986 in accordance with the existing provisions of Annex IV, Chapter 5.

The Commission accepts the conclusions of the Southern Panel concerning the impact of additional Canadian Georgia Strait hatchery production (Expo coho) expected to be available for harvest in 1986. The Coho Technical Committee reviewed the impact of this additional production and determined that it could increase this component of the catch; however increases over 1985 catch levels cannot be forecast at this time. The Commission was unable to evaluate whether or not there would be an overall increase in Canadian contribution to the West Coast of Vancouver Island troll fishery based on this hatchery increase. The Commission

instructs the Coho Technical Committee to develop recommendations for research programs designed to provide information on stock compositions in all fisheries of concern.

The actual catch of coho salmon by the West Coast of Vancouver Island troll fishery was 326,000 pieces (preliminary) less than the 1985 fishery regime ceiling of 1.75 million. No compensation for this shortfall shall occur in 1986. The Commission shall develop fishery regimes for 1987, and subsequent years, taking into consideration compensation for this shortfall. The Commission will ensure that the principles of Article III and Annex IV, Chapter 5 of the Treaty guide it in the development of future coho fishery regimes. The Commission may consider other approaches to compensation besides adjustment of coho fishery regimes for the West Coast of Vancouver Island troll fishery.

The Commission agrees that payback provisions of the coho annex (Annex IV, Chapter 5) and the Fraser River annex (Annex IV, Chapter 4) shall be applied in the same manner. However, the provisions relating to deviations from catch limits on Transboundary Rivers (Annex IV, Chapter 1) and Chinook (Annex IV, Chapter 3) may not necessarily be applied in that manner.

FRASER RIVER SOCKEYE

The summer run stocks of Fraser River sockeye in 1986 include Early Stuart, Bowron, Pitt, Gates, Fennell, Late Nadina, Chilko Lake, Horsefly-Mitchell, Raft, Seymour, Scotch, Late Stuart, Chilko River, Stellako and any minor stocks with migratory timing coinciding with the aforementioned stocks. The Birkenhead stock is included with the late runs.

The preseason forecast for Fraser River sockeye in 1986 is 14,000,000 of which 2,405,000 are summer run fish. The spawning escapement goal for the summer runs in 1986 is 690,000 fish. For the purposes of computing the Total Allowable Catch on the summer runs and the United States share thereof, the Fraser River Indian food fishery component of the gross escapement for summer runs is 262,000 fish. Based on the above computation the Total Allowable Catch of summer runs will be 1,453,000 sockeye.

Based on the preseason forecast, the United States share of the summer run of Fraser River sockeye in 1986 shall be 444,675 sockeye derived as follows: the United States basic share is 29.93% of the Total Allowable Catch, which equals a catch of 434,883 summer run sockeye which will be adjusted in proportion to any adjustment in the Total Allowable Catch. The United States share of the summer run Total Allowable Catch shall be reduced by 8,589 summer run sockeye, which are a portion of the 50,000 coho adjustment specified in paragraph 1(b) (iii) of Chapter 4 of Annex IV of the Treaty and increased by 18,381 summer run sockeye, which are a portion of the preliminary estimate of the 1985 Canadian Fraser sockeye overage of 107,000 sockeye. The remaining adjustments of 41,411 sockeye of the coho adjustments will be applied to the United States share of late runs in 1986. The remaining 88,619 sockeye of the 1985 sockeye overage will be applied to the United States share of late runs in 1986 unless otherwise agreed by the Fraser River Panel.

Of the total payback from the 1985 Fraser sockeye overage, 17.18% shall be summer run sockeye based on the preseason expectations of total summer run fish to total run. The payback for the 1985 sockeye overage shall be adjusted in accordance with any adjustments in the final sockeye overage estimate.

In 1987, 1988 and 1989 the United States share of the Total Allowable Catch of the Fraser River sockeye shall be distributed so that the United States proportional share of the Total Allowable Catch of summer runs shall be the same as the United States proportional share of the Total Allowable Catch of late runs, and otherwise in accordance with Chapter 4 of Annex IV of the Treaty.

CHINOOK

In response to concerns expressed by the Joint Technical Committee for chinook, the Commission agreed that base catch ceilings for Southeast Alaska and northern British Columbia need to be reduced in response to the potential cumulative impact of induced mortalities and harvest in excess of ceilings. The base ceilings for 1986 only will be:

S. E. Alaska all gear catch	254,000 chinook
Northern B.C. all gear catch	256,000 chinook

In 1986 the Southeast Alaska all-gear catch of chinook shall consist of the base catch (above) plus a catch of new Alaska hatchery add-on to be calculated in-season as described in Alaska's 1986 add-on proposal. The preseason expectation for the 1986 add-on is 23,000.

In response to the concerns expressed for Strait of Georgia chinook stocks by the Joint Technical Committee, the Commission agrees that Canada will invoke management actions, as appropriate, in 1986 and 1987, to return to the rebuilding schedule by the end of 1987.

The Commission and the Panels, in the establishment of fisheries for 1987 and subsequent years, will take into account all sources of chinook mortalities in implementing the chinook rebuilding program.

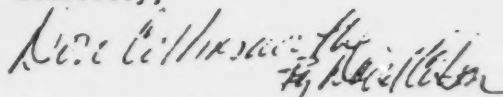
The Commission requests that the responsible management agencies provide information in 1986 to account for all fishing-related sources of increased and decreased mortalities since implementation of the Treaty.

The Joint Technical Committee on Chinook Salmon will provide assessments to the Commission and the Panels on the impact of fishing-related mortalities on the chinook rebuilding program.

The Commission will appoint a work group to identify means of addressing overages and underages from catch ceilings in the future. Incentives to discourage consistent overages should specifically be addressed in order to ensure consistency with the intention of the chinook rebuilding program.

Finally, in respect of transboundary rivers, the Commission wishes to note that it will not be possible to reach agreement on the percentage of the Total Allowable Catch of salmon that shall be deemed to be of United States origin for purpose of implementing Article III, paragraph 1 (b) of the Treaty in accordance with the time frame allowed in paragraph D of the Memorandum of Understanding to the Treaty. Accordingly, the Commission proposes that the Governments agree to a one-year extension of the time limit for determining this percentage.

Sincerely,



Don W. Collinsworth
Chairman
Pacific Salmon Commission

Originals also sent to:

The Honourable George P. Shultz, Secretary of State
The Honourable Tom Siddon, Minister of Fisheries and Oceans

APPENDIX 2

**1986 TROLL PLANS
FOR THE STRAIT OF GEORGIA**



1986 GULF TROLL PLANS

The Department of Fisheries & Oceans met with the Inside Troll Advisory Committee on March 26, April 18, April 24, May 6 and May 28, 1986. The purpose of these five meetings was to develop troll fishing plans for the 1986 season. It was difficult to develop a plan to account for all concerns, because of the opposition to the chinook salmon limit; however, the Department has adopted the following plan after consultation with trollers.

OVERVIEW

The 1986 troll fishing plan for the Strait of Georgia applies to Statistical Areas 13 - 18 and 29 and provides for:

1. Fishing opportunities during late June, July, August and September. These opportunities may include specific fisheries for surplus hatchery coho (Expo coho) in the Qualicum area during October.
2. Fishing for chinook and coho will start June 20.
3. Fishing for sockeye will start July 27 below Seymour Narrows.
4. Fishing times for sockeye in the net fishing area of Areas 13, 18 and 29 are separated where possible from those of net gear.
5. The minimum size limit for chinook salmon has been changed from 54 cm to 62 cm and the use of single barbless hooks will be implemented in 1986. These changes were proposed by the Committee as a means of controlling the rate of chinook catch in order to provide as continuous a fishery as possible.
6. Non-retention of pink salmon in the net fishing area of Area 13. This change was proposed by the Committee for conservation of Study Area pink stocks.
7. Of the sockeye allocation, a portion equal to 60,000 pieces, is to be taken by August 16.

CATCH LIMITS

Chinook

The catch ceiling for 1986 will be 44,100 fish. This number has been reduced from the 1985 ceiling of 50,000 by subtracting one half of the 1985 overages (1,100), one half of the 1985 non-retention mortalities (2,300), and subtracting the effect of the change in size limit and barbless hooks (2,500).

Sockeye

The catch allocation for sockeye in 1986 will be 262,000 fish, or about 3.5% given current expected run size. Of the early to mid-summer timing stocks only the Chilko stock has a harvestable surplus. The majority of the harvestable surpluses are in the late stocks of Birkenhead, Weaver and mainly Adams - Lower Shuswap sockeye runs. In order to conserve the early to mid-timing stocks and harvest primarily the more abundant later stocks, no

fisheries (net or troll) are proposed until July 27. Therefore, extended opportunities to troll for sockeye will be provided starting in the middle of August.

Coho

There is no specific catch limit on coho catches in 1986. The 1986 cycle and particularly wild returns to the Fraser River require conservation. Therefore, the Department must constrain harvest rates at those levels experienced in recent years. At the same time, because of Expo coho production, additional opportunities can be provided by fishing in the Gulf in late June and possibly by fishing during October in the Qualicum area.

Chum and Pink

There are no specific catch limits for these species. In recent years, catches have been minor. Continued weak returns of Study Area pink stocks will require that trollers address conservation measures in concert with the net fisheries. Chum catches are to be monitored to ascertain if targeting occurs.

FISHING PLANS

1. Chinook

Chinook fishing will begin on June 20. The use of single barbless hooks will be required until sockeye fishery opens to troll gear on July 27. The size limit for chinook salmon will be increased from 54 cm observed in 1985, to 62 cm (nose to fork) for the 1986 season. It is expected that fishing under this plan will result in a chinook catch of 44,100 being taken by late September thus avoiding mid-season closures and extensive beach boundaries used in 1985.

If in-season catch rates are in excess of those expected, further actions may be required to slow the catch rates and avoid non-retention fisheries and an early end to the fishing season. Additionally, portions of Areas 17 and 18 may be closed to provide specific conservation of Nanaimo, Chemainus and Cowichan River chinook stocks.

2. Coho

Coho fishing will also begin on June 20 and continue to September 30. Additional opportunities during October to harvest hatchery surplus coho in specific portions of Area 14 (Qualicum) may be possible. Details will be announced at a later date.

3. Sockeye

Sockeye retention will be permitted July 27 in the open areas of Area 13 (below Seymour Narrows), 14, 15, 16 and 17. Trolling will be conducted 7 days each week and from July 27 onward barbed hooks will be permitted. In the northern portion of Area 13 (the Johnstone Strait net fishing area) trolling will be permitted 3 days each week starting the week of August 3. Trolling fishing times will be separated from net fishing times. In sub-areas 18-1,

18-4, 18-11 trolling will be permitted 7 days each week until August 16 or until a 60,000 catch has been achieved. If a 60,000 total catch for Areas 13 - 18 and 29 is reached before August 16, then fishing in Areas 18 and 29 will be restricted.

The retention of pink salmon will be prohibited in the northern portion of Area 13 (the Johnstone Strait net fishing area).

Detailed Fishing Plans

A) JUNE 20 TO JULY 26, 1986

As of June 20, 1986 0001 hrs to July 26, 1986 2359 hrs, trolling will be permitted 7 days each week in the following areas with retention of all salmon species except sockeye. Single barbless hooks are required.

Area 13, sub-areas 13-1 to 13-3 and 13-14 to 13-20 and 13-23 only open.

Area 14, all sub-areas open except 14-11 and 14-14 (Comox Harbour) which are closed.

Area 15, all sub-areas open except 15-6 (Toba Inlet) which is closed.

Area 16, all sub-areas open.

Area 17, all sub-areas open except 17-7 and 17-14 which are closed.

Area 18, all sub-areas open except 18-8 which is closed.

Area 29, sub-areas 29-1 to 29-5 only open.

B) AS OF JULY 27, 1986

As of July 27, 1986 0001 hrs, barbed hooks are permitted and fishing is permitted for all salmon species as follows:

Area 13, sub-areas 13-1 to 13-3 and 13-14 to 13-20 and 13-23 open 7 days each week. For sub-areas 13-7 to 13-9, the westerly portion of 13-10 and 13-27 to 13-32, trolling is permitted following the net fishery but with non-retention of pink salmon as follows:

August 3 to September 6
(five weeks)

Three days each week.

Area 14, All sub-areas open 7 days each week except 14-14 (Comox Harbour) and 14-11 which are closed.

Area 15, all sub-areas open 7 days each week except sub-area 15-6 (Toba Inlet) which is closed.

Area 16, all sub-areas open 7 days each week.

Area 17, all sub-areas open 7 days each week except 17-7 and 17-14 which are closed. Sub-area 17-5 and a portion of 17-9 will be closed August 1 until further notice.

Area 18, sub-area 18-8 closed, sub-areas 18-2, 18-3, 18-5, 18-6, 18-7, 18-9 and 18-10 open 7 days each week.

For sub-areas 18-1, 18-4 and 18-11 only:

Trolling will continue 7 days each week until August 16 or until the catch of sockeye in Areas 13 to 18 and 29 totals 60,000 pieces. On this date or at this number, these sub-areas will be opened in accordance with net fisheries. As of August 17, trolling is permitted each week in these sub-areas following the net fishery as follows:

August 17 to August 23 (Two weeks)	Two days each week
August 24 to August 30 (One week)	Four days each week
August 31 to September 6 (One week)	Three days each week
September 7 to September 13 (One week)	Two days each week

Area 29, sub-area 29-5 open 7 days each week.
For 29-1 to 29-4 inclusive:

Trolling will continue 7 days each week until August 16 or until the catch of sockeye in Areas 13 to 18 and 29 totals 60,000 pieces. On this date or at this number, these sub-areas will be open as follows:

July 27 to August 16 (three weeks)	One day each week
August 17 to August 23 (two weeks)	Two days each week
August 24 to August 30 (one week)	Four days each week
August 31 to September 6 (one week)	Three days each week
September 7 to September 13 (one week)	Two days each week

For sub-area 29-6 as of July 27 trolling permitted immediately following the net fishery as follows:

July 27 to August 16 (three weeks)	One day each week
August 17 to August 23 (two weeks)	Two days each week
August 24 to August 30 (one week)	Four days each week
August 31 to September 6 (one week)	Three days each week
September 7 to September 13 (one week)	Two days each week

Note 1 Fishing times, as always, are subject to changes given in-season assessment of run sizes and timing.

Note 2 All openings listed are in effect only until the catch limits are reached.

Note 3 In addition to those closures listed above, some local river mouth boundaries are in effect. As well, sport fishing spot closures are also closed to commercial trolling. Contact local DFO offices for details.

Note 4 The initiation of the sockeye fishery on July 27 may be advanced if early stocks are harvestable and net fisheries are conducted in Area 29 prior to July 27.

Note 5 For Clarification

Management Area 12 - Commercial trolling will be restricted to net fishing times and areas, except sub-areas 12-10 and 12-13 (Deserters group) which are open seven (7) days per week from June 20 to August 31, 1986. Troll fisheries opportunities in sub-areas 12-10 and 12-13 will be limited if the troll effort exceeds 1985 levels or if the chinook catch exceeds 5,000 pieces.

APPENDIX 3

1986 STRAIT OF GEORGIA
SHAKER MONITORING PROJECT

G. E. GILLESPIE

The Pacific Salmon Treaty required an estimate of new induced fishing mortality of chinook. Legal size shakers during chinook non-retention fisheries are considered to be new induced fishing mortality, and a shaker monitoring program was implemented to estimate the losses of legal size (>62 cm fork length) chinook between July 17 and October 11, 1986.

METHODS

Observers were placed on vessels for periods of minimum one hour and maximum three hours. Observers recorded vessel name, statistical sub-area fished, time and duration of observations, and number of shakers in three size classes: over 62 cm length, 62 cm - 54 cm, and less than 54 cm in length. Sampling effort was expected to parallel fleet effort with regard to spatial and temporal distribution.

In addition, shaker information was recorded by three vessels participating in the Gulf Troll Logbook Program. These vessels recorded number of chinook shakers in each size class, area and time period fished, as well as catch of other species.

The chinook non-retention fisheries were divided into two classes: a coho-directed fishery with a high incidence of chinook shakers, and a sockeye-directed fishery with a low incidence of chinook shakers. It is known that trollers encounter more chinook salmon when fishing for coho, than when fishing for sockeye. For this reason, coho- and sockeye-directed fisheries were treated separately. When both these fisheries were occurring simultaneously, vessels counted from aerial overflights were attributed to a given fishery type according to location of fishing.

Proposed sampling effort for the coho-directed fisheries had one sampler working in each of the Campbell River (Area 13), Powell River (Areas 15, 16), and Comox/Qualicum areas (Area 14), following fleet concentrations. During sockeye-directed fisheries, one sampler was to move to the Fraser River area (Areas 29 and 18), and one sampler was to monitor the ongoing coho-directed fishery in the upper and central Gulf. The overall proposed sampling density was 12 to 18 boat-hours of observation per day of chinook non-retention fishery.

Average daily gear counts (see Section 2.5) and average daily shaker rates were calculated for each fishery. Hourly shaker rates were multiplied by an average 10-hour fishing day (Jordan and Carter 1986) to give daily shaker rates. The product of average daily gear counts and average daily shaker rates was multiplied by the number of days in the fishery to give a total shaker estimate for chinook larger than 62 cm. Shaker deaths were estimated by assuming a mortality rate of 0.3 on released fish (Argue et al. 1983).

RESULTS

A summary of the results of the 1986 Strait of Georgia Chinook Non-retention Shaker Monitoring Program is provided in Appendix Table 3-1. An estimated total 5,151 shakers longer than 62 cm were released during the 1986 chinook non-retention fishery; all observed shakers came from the coho-directed fishery and none from the sockeye-directed fishery.

The proposed number of samples (see methods above) was not achieved in 1986. Instead, 26 gear count flights and 14 surface counts were conducted in

the Strait of Georgia between July 17 and October 11, and 167.35 boat-hours of on board observation, as well as 33 boat-days of logbook information were recorded.

During the sockeye-directed fishery, 21 observations totalling 20.5 boat-hours were conducted, and no chinook shakers over 62 cm were observed (only 4 chinook under 62 cm were seen). The number of boardings conducted in the sockeye-directed fishery was well below the proposed sampling intensity and insufficient to record the rare event of a legal size chinook shaker in this fishery. In the future, a greater sampling intensity will be required to estimate accurately shaker rates in the sockeye-directed fishery.

Appendix Table 3-1. Chinook non-retention shaker summary for Strait of Georgia, 1986.

PERIOD	DAYS FISHED	EFFORT (BOAT-DAYS)	S.D. ^a	n ^b	SHAKERS /DAY (>62cm)	S.D. ^c	n ^d	TOTAL SHAKERS (>62cm)	S.D. ^e	COMMENTS
Jul 17-Aug 2	17	63.00	30.56	8	1.72	3.64	45	1847	260	Coho-directed fishery.
Aug 3-Sep 30	59	23.63	14.92	16	2.29	3.26	64	3191	97	Coho-directed fishery.
Oct 1-11	8	4.50	1.50	2	2.29	3.26	0	113	16	Coho-directed fishery - Area 14
Aug 3-10	8	126.00	10.00	2	0.00	0.00	10	0	0	Sockeye-directed fishery-Area 29
Aug 8-21	14	60.07	9.76	14	0.00	0.00	11	0	0	Sockeye-directed fishery-Area 13
Aug 17-Sep 5	20	53.83	46.41	6	0.00	0.00	0	0	0	Sockeye-directed fishery-Areas 29,16
Sep 28-Oct 1	4	39.00	0.00	1	0.00	0.00	0	0	0	Sockeye-directed fishery-Area 29
TOTAL							5151	278		
										BOARDINGS = 70
										LOG RECORDS = 49
										TOTAL OBSERVATIONS = 119
										TOTAL SHAKER MORTALITY = 1545

^a Standard deviation of boat-days.

^b Number of gear counts.

^c Standard deviation of shakers per day.

^d Number of observations of shaker rates.

^e Standard deviation of estimates of total shakers.

APPENDIX 4

INFORMATION BULLETIN:

1986 SALMON TROLL FISHING PLANS

FOR WCVI

June 19, 1986

1986 COMMERCIAL SALMON TROLL FISHERY PLANS FOR THE WCVI

This bulletin provides details regarding the 1986 salmon troll fishing plan which has been developed through consultations with the Outside and Inside Troll Co-Management Committee.

SUMMARY - WEST COAST VANCOUVER ISLAND

The 1986 troll fishing plan for the West Coast of Vancouver Island is as follows:

1. Catches for chinook and coho salmon are limited to 360,000 and 1.75 million pieces respectively in accordance with the Pacific Salmon Treaty in the following areas: 21-27; 121-127; 130-1.
2. Trolling for chinook, coho and chum will start June 20 with non-retention of sockeye and pink salmon in effect until late July.
3. Trolling for pink salmon will commence with the opening of the Johnstone Strait commercial salmon net fishery presently scheduled for July 27.
4. Retention date for sockeye salmon will be 3 to 4 days ahead of the Johnstone Strait net fishery presently scheduled for July 27 but may be delayed one week due to expected late arrival of Chilko sockeye.
5. If it becomes necessary to slow the catch rate of chinook and coho salmon for the purpose of avoiding non-retention fisheries and an early end to the fishing season, specific time and area closures will be put into effect as deemed appropriate in consultation with representatives of the Outside Troll Co-Management Committee.
6. Trolling with barbed hooks will be permitted as of June 20.
7. Swiftsure Bank will be closed until July 1, 1986, for the protection of early timing Canadian coho stocks (particularly Fraser).

**1986 COMMERCIAL SALMON TROLL FISHERY PLANS FOR THE WCVI
MANAGEMENT AREAS 11, 12, 21-27, 121-127, 130-1**

DETAILS

Catch Limitations

As provided for in the Pacific Salmon Treaty, the 1986 troll catch for WCVI shall not exceed 360,000 chinook and 1.75 million coho salmon in Statistical Areas 21, 23, 24, 25, 26, 27, 121, 123, 124, 125, 126, 127 and 130-1. There are no specific catch allocations for pink salmon in 1986 as it is an off year for Fraser River pink salmon. However, a period of non-retention for pink salmon is required to provide for conservation of Study Area pink stocks (Non-Fraser stocks). Troll chum catches are to be limited to historic levels of incidental catches. Troll sockeye fishing in Areas 21 to 27, 121 to 127, 130-1, 111, 11 and 12, will be limited to a catch ceiling of 20.5% of the Canadian Total Allowable Catch (TAC) of Fraser sockeye. Based on expectations, the ceiling is 1,448,000 sockeye.

Trolling Dates

Trolling for chinook salmon will start on June 20 and may continue to October 15 depending on abundance. Fishing for coho and chum salmon is permitted from June 20 to September 30. However, coho salmon fishing will be closed prior to September 30 if the coho catch ceiling is achieved. The Swiftsure closure to July 1 should assist conservation of early timing Canadian coho stocks (particularly Fraser). Trolling for pink salmon will commence in conjunction with the opening of the Johnstone Strait commercial salmon net fishery. Trolling for sockeye salmon will commence 3 or 4 days ahead of the first Johnstone Strait net opening. This net opening is scheduled for July 27 but may be delayed one week due to expected late arrival of Chilko sockeye. The early timing sockeye stocks are required for conservation with the first part of Chilko required to meet Canada's international and domestic allocation requirement. The sockeye troll allocation is to commence on later Chilko and Adams stocks.

Scheduled Catch Rates

The troll management plan has been developed to avoid, where possible non-retention fisheries and an early end to the fishing season. Catch rates will be tracked in-season with a system of pre-season forecasted catch ("Red Line").

If the catch rates of chinook and/or coho progress to a level which, if continued, would result in an early end to the fishing season (above the "Red Line"), specific time and area closures will be used to slow the rate of catch. Such closures would occur in the southwest coast area of Vancouver Island and would be implemented after 48 hours notice. In-season conference calls have been established with representatives of the Outside Troll Co-management Committee for this contingency.

Fishing Plan

The detailed fishing plan is as follows:

As of June 20, 1986

At 0001 hours, the following Management Areas will open until further notice to commercial salmon trolling for chinook, coho and chum salmon only. Management Areas 121 to 127 inclusive and 130-1, 111, 11-1, 11-2, 23, 24, 25, 26 and 27 except as follows:

The following Management Areas will remain closed as indicated for the conservation of local chinook salmon stocks:

Management Area 21, and sub-areas 121-1, 121-2 and 123-1 (Swiftsure) which remain closed to trolling until 2359 hours June 30. Management Area 21 will be closed again at 0001 hours, August 1, 1986, until further notice.

Management sub-areas 23-1, 23-2 (Alberni Inlet) remain closed until further notice.

Management sub-areas 25-1 to 25-6, 25-8 to 25-12 inclusive, 25-15 and 25-16 remain closed until further notice.

Management sub-areas 26-2 to 26-6 and 26-8 to 26-10 inclusive remain closed until further notice.

Management sub-areas 27-7 to 27-11 remain closed until further notice.

Management sub-areas 24-10, 24-11 and 24-12 plus 25-7, 25-13, 25-14 plus 26-1, 26-7, 26-11 plus remaining sub-areas of Area 27 will be closed to trolling 0001 hrs August 1, 1986 until further notice.

NOTE 1:

Non-retention of sockeye and pink in effect in Management Areas 121 to 127 inclusive, 130-1, 111, 11-1, 11-2, 23, 24, 25, 26 and 27.

(A) Retention of sockeye salmon will commence 3 to 4 days ahead of the Johnstone Strait commercial net fishery presently scheduled to open July 27. This opening may be delayed one week due to expected late arrival of Chilko sockeye. The final decision on the sockeye opening day will consider actual run timing and diversion rates.

(B) Retention of pink salmon will commence on the date that coincides with the opening of the Johnstone Strait commercial salmon net fishery.

NOTE 2:

FOR CLARIFICATION, the commercial salmon troll fishing plan established for Areas 11 and 12 is as follows:

Area 11:

Sub area 11-2 will be regulated in concert with Management sub-area 10-2.

Area 12:

Commercial trolling will be restricted to net fishing times and areas, except sub-areas 12-10 and 12-13 (Deserters group) which are open for chinook and coho only seven (7) days per week from June 20, 1986 until further notice. Troll fisheries opportunities in sub-areas 12-10 and 12-13 will be limited if the troll effort exceeds 1985 levels or if the chinook troll catch in all of Area 12 exceeds 5,000 pieces.

NOTE 3:

Barbed hooks will be permitted as of June 20, 1986.

APPENDIX 5

**PROPOSED 1986 WCVI TROLL PLANS
AND THEIR EVALUATION**



1986 WCVI SALMON TROLL PLANS

The following section outlines some advantages and disadvantages of the proposed WCVI troll plans for 1986. Although each plan has different impacts on fishermen and industry, this discussion considers only the concerns relevant to DFO.

The three general concerns expressed by the Chinook and Coho Technical Committee Chairmen were: (a) that the catch ceilings for chinook and coho not be guaranteed by increasing fishing effort (and therefore harvest rates) over the levels of effort allowed in recent years, (b) that late season fisheries in October may increase shaker losses and/or result in differentially higher harvest of U.S. coho stocks or weakened Canadian chinook stocks, and (c) that the early-season fishery in June may direct effort onto Canadian coho stocks which include depressed Fraser coho stocks (Fraser stocks approx. 10% of total WCVI coho, R. Kadawaki pers. comm.)

These and other concerns are related below to the advantages of each proposed fishing plan. Appendix Table 5-1 lists opening and closing dates by species for troll Plans A, B and C.

Plan A

Plan A proposal represents a single summer fishery. This is in contrast to a split-season fishery involving several weeks open in May (as in 1984 and 1985), with the balance of the fishery occurring in July to September.

Advantages

The main advantages of Plan A come from foregoing the May opening and are as follows:

- a) saving DFO resources since the need to monitor catches to a sub-ceiling level in May is eliminated,
- b) reduced possibility of non-retention fishery on chinook later in the season since spring fishery on chinook is eliminated,
- c) reduced likelihood of spot closures to slow the rate of chinook catch,
- d) zero shakers (sublegal chinook or released coho) taken in spring.

Disadvantages

The main disadvantages of Plan A stem from potentially fishing more total days than in 1985. If the catch ceiling is not reached before the end of the season, then extended days could mean more total effort. Specific points of concern are as follows:

- a) 118 days maximum allowed chinook fishing under Plan A is potentially 12 days more than in 1985. (Note that there were approximately 170 days of chinook fishing each year during the 1979-82 base period which lasted from April 15 to September; in 1979 and 1980 fishing was conducted into October.) If the fishery ran to the full days open, then harvest rates on chinook may increase over 1985.

- b) Point "a" also applies to coho ie., 10 more potential fishing days than in 1985.
- c) Fishing into October could cause increased shaker deaths on abundant sublegal coho and could impact weak Canadian chinook stocks.
- d) Some concern was also expressed regarding the 1986 cycle year of Fraser River coho. However, these stocks are expected to comprise a small fraction of WCVI catch.

Plan B

This plan involves a two-week May fishery followed by a closure until July 1. This is a split season fishery with a reduced spring opening.

Advantages

- a) An extended fishery, starting in spring, may spread harvest over a larger number of stocks thus avoiding intensive targeting on fewer stocks over a shorter period.
- b) Slightly reduced harvest rates over Plan A may be expected due to 5 fewer days in maximum allowed chinook season and 4 fewer days in maximum allowed coho and chum seasons than in Plan A.
- c) Less fishing may be expected in October during period of concern for sublegal coho, compared to Plan A.

Disadvantages

- a) There is a higher chance of chinook non-retention fisheries than in Plan A.
- b) There is a higher chance of a need for spot closures or other measures to slow rate of chinook catch than in Plan A.
- c) More coho shakers may be expected due to spring coho non-retention fishery, and more sublegal chinook may be captured than in Plan A.

Plan C

This is a modified Plan A, with a single summer season that, for purposes of coho conservation, starts on June 24 rather than June 20. The same advantages and disadvantages apply as listed above for Plan A except the disadvantages are slightly reduced in magnitude.

WEST COAST TROLL MODEL EVALUATION

Plans A, B and C were evaluated using the recently developed troll model. Appendix Table 5-2 lists the predicted changes in harvest rates relative to 1985 and 1982 base years. Plans A, B and C yielded very similar outcomes in that all showed a modest increase in harvest rates relative to 1985 (+2% chinook, +4% coho) and a notable decrease in harvest rates relative to 1982 (-16% chinook, -8% coho). These predictions of the rate of catch accumulation depend on assumptions made regarding stock abundance in 1986 (see footnotes to Appendix Table 5-2), as well as assumptions about effort, prices and opening dates for important species like sockeye. However, it should be noted that according to the model, both chinook and coho ceilings were expected to be reached prior to September 30, 1986 which means that October fisheries for any plan were not expected that year.

The Technical Committees' main concern was the extension of the fishing season. Extensions would have the effect of changing the ceiling to a quota. Such a change, if continued over several years, would affect the 1998 target year of salmon stock rebuilding. This would be of particular concern if stock abundance was lower than expected. The Department stated these concerns to the Troll Groups (April 11 and 12), and pointed out that, given reduced abundance for both chinook and coho, Plans A, B and C were not equivalent. Furthermore, these plans had a potential of shifting harvest rates disproportionally to some stocks. Thus, some modifications to the Plans or other changes were required to alleviate those concerns.

In summary, although there appear to be only minor differences expected in harvest rates between Plans A, B and C, and although extended fishing in October is not expected in 1986, Plan B was selected as the safest strategy since it spreads harvest over a longer period compared to Plans A and C, thereby avoiding some of the concerns expressed by the Technical Committee. Plan C was the second logical choice since it has fewer maximum allowed fishing days than Plan A. Note however, that after all the concerns were reviewed, the actual 1986 fishing plans for WCVI adopted Plan A which represents a single summer fishery.

Appendix Table 5-1. Troll plans for WCVI, 1986.

PLAN A - (A Single Summer Fishery)

<u>SPECIES</u> ^a	<u>OPENING</u> ^b	<u>CLOSING</u> ^b
Chinook	June 20	October 15 or on ceiling
Coho	June 20	September 30 or on ceiling
Pink	(See footnote c)	September 30 or on allocation
Chum	June 20	September 30 or on allocation
Sockeye	(See footnote c)	September 30 or on allocation

PLAN B - (A Split Season Fishery)

<u>SPECIES</u>	<u>OPENING</u>	<u>CLOSING</u>
Chinook	May 12	May 26
	July 1	October 7 or on ceiling
Coho ^d	July 1	October 7 or on ceiling
Pink	(See footnote c)	September 30 or on allocation
Chum	July 1	September 30 or on allocation
Sockeye	(See footnote c)	September 30 or on allocation

PLAN C - (Modified Plan A)

<u>SPECIES</u>	<u>OPENING</u>	<u>CLOSING</u>
Chinook	June 24	October 15 or on ceiling
Coho	June 24	September 30 or on ceiling
Pink	(See footnote c)	September 30 or on allocation
Chum	June 24	September 30 or on allocation
Sockeye	(See footnote c)	September 30 or on allocation

^a Chinook and coho are constrained by the ceiling/season concept; that is, closures occur on whatever comes first.

^b For chinook and coho, the opening and closing dates are coordinated with the North Coast. North Coast opening date for Plans A and C is June 24, and for Plan B, July 1.

^c The intention is to coincide the pink and sockeye troll openings with the initiation of the Johnstone Strait net opening. This opening could occur as early as July 20 or as late as August 3.

^d Coho October fishery to occur only if chinook fishery is also open.

Appendix Table 5-2. Predicted changes in chinook and coho harvest rates relative to 1982 and 1985 base years, using fishing Plans A, B, and C^a.

HARVEST RATES RELATIVE TO BASE YEAR								
SPECIES	(MAX) CATCH	WEEK OF MAX. CATCH	1985 BASE			1982 BASE		
			TOTAL	STOCKS		TOTAL	STOCKS	
				CAN	US		CAN	US
<u>PLAN A</u>								
Chinook	360K	9-3	+1%	+2%	+1%	-19%	-16%	-20%
Coho	1.75M	9-2	+3%	+3%	+3%	- 9%	- 9%	- 9%
<u>PLAN B</u>								
Chinook	360K	9-3	0	+2%	-1%	-19%	-15%	-20%
Coho	1.75M	9-2	+4%	+4%	+4%	- 8%	- 8%	- 8%
<u>PLAN C</u>								
Chinook	360K	9-4	0	+2%	-1%	-20%	-16%	-21%
Coho	1.75M	9-2	+4%	+4%	+4%	- 7%	- 7%	- 7%

^aThe following assumptions were made in conducting this analysis:

- i) 1986 chinook abundance was similar to 1985,
- ii) 1986 coho abundance was 5% less than in 1985,
- iv) Sockeye fishing opened August 3.

APPENDIX 6

WEST COAST VANCOUVER ISLAND TROLL MODEL

by

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1.0 INTRODUCTION

This appendix presents a brief description of a simulation model designed to assist fisheries managers in the evaluation of management options for the WCVI Troll Fishery.¹ The WCVI Troll model is described in detail in a Technical Report of Fisheries and Aquatic Sciences No. 1526 entitled "Development of Troll Fishery Management Models for Southern British Columbia (English et al. 1988). This report also presents the results from analysis of coded wire tag recovery data, catch and effort data, and biosampling data conducted prior to the development of the WCVI Troll model.

2.0 SPATIAL, TEMPORAL AND STOCK RESOLUTION

The first step in the construction of the model was the definition of the spatial, temporal and stock resolution. The spatial scale defines the WCVI troll fishery as a single fishery (Statistical Areas 21, 23-27). The temporal scale includes 40 periods; 39 one-week periods and one 13-week period identical to those used in the MRP and Catch Statistics databases (see Table 1). The model includes all five species of Pacific salmon sub-divided into 13 distinct stocks defined in Table 2.

The level of resolution selected for the model reflects the basic objective of the project to develop the simplest model that would be useful in evaluating a wide range of management options. The temporal resolution of one week represents the maximum resolution of most of the data collected for the fishery.

The stock resolution includes the stocks, for which data are available, that are of primary interest to south coast fisheries managers. The spatial resolution was selected for the following reasons:

1. the lack of reliable information on the movement of chinook and coho stocks within the West Coast troll fishery.
2. the complexity associated with detailed stock movement models.
3. the need to develop a mechanism for handling area closures that are smaller than the spacial resolution that could be reasonably modelled.

Since we were able to develop a mechanism for handling small area closures, managers can evaluate the relative effects of regulation actions of any spatial scale.

¹The simulation model was prepared for the Department of Fisheries and Oceans, Operations Branch, South Coast Division, Hook and Line Section, by LGL Limited; and was the result of a series of workshops directed toward evaluating troll management actions.

Table 1. Definition of time periods.

Week Number	Statistical Week	Week Number	Statistical Week
1	3-1	21	7-4
2	3-2	22	7-5
3	3-3	23	8-1
4	3-4	24	8-2
5	4-1	25	8-3
6	4-2	26	8-4
7	4-3	27	9-1
8	4-4	28	9-2
9	4-5	29	9-3
10	5-1	30	9-4
11	5-2	31	10-1
12	5-3	32	10-2
13	5-4	33	10-3
14	6-1	34	10-4
15	6-2	35	10-5
16	6-3	36	11-1
17	6-4	37	11-2
18	7-1	38	11-3
19	7-2	39	11-4
20	7-3	40	12.1 through 2.4

Table 2. Definition of stocks.

Species	Stocks	Description
Chinook	Canadian	Originating from Canadian streams or hatcheries.
	U.S.	Originating from U.S. streams or hatcheries.
Coho	Canadian	Originating from Canadian streams or hatcheries.
	U.S.	Originating from U.S. streams or hatcheries.
Sockeye	E. Fraser	Early run Fraser River stocks: Stuart, Horsefly, Chilko, Stellako, Birkenhead, Pitt, Nadina, Seymour, Raft, Bowron, Gates.
	L. Fraser	Late run Fraser River stocks: Adams, Lower Shuswap, Weaver, Portage, Harrison, Cultus.
	U.S.	U.S. Stocks: Lake Washington.
Pink (odd)	Georgia Strait	Originating from streams on middle eastern Vancouver Island, and streams flowing into Phillips Arm, Toba Inlet, Howe Sound, Jervis Inlet and Burrard Inlet.
	Fraser U.S.	Originating from the Fraser River. U.S. Stocks: Nooksack River, Skagit River, Puget Sound.
Pink (even)	Upper Van. Is.	Originating from streams on Upper Vancouver Island and streams flowing into inlets between Kingcome and Wakemen Inlet.
	Johnstone Strait and Area	Originating from streams in the following areas: Johnstone Strait, Bard to Knight Inlet, Loughborough to Bute Inlet, Phillips Arm and the Bear River.
	Mid. Van. Is.	Originating from streams on middle eastern Vancouver Island.
Chums	Summer	Summer runs possibly originating from B.C. central coast.
	Canadian	Fall runs originating from Canadian streams: Lower and southern Vancouver Island, Howe Sound, Fraser River.
	U.S.	Fall runs originating from U.S. streams: Nooksack, Skagit, Stillwater-Snohomish, Puget Sound and Hood Canal.

3.0 MODEL STRUCTURE

The model was structured so that the user can reconstruct the weekly WCIV troll catch for any base year. The decision to use this approach places the following constraints on the model:

1. extensive data requirements for sockeye, pink and chum run reconstruction.
2. the use of the South Coast Stock Planning Model for sockeye, pink and chum run reconstruction.
3. extensive parameter requirements for chinook and coho cohort analyses.
4. development of chinook and coho cohort analysis models for the West Coast troll fishery.
5. the execution of the run reconstruction and cohort analysis models prior to the execution of the West Coast Troll Model for any base year.

Figure 1 shows the sequence of tasks required to prepare a base year for the West Coast Troll Management Model. The tasks required to prepare a single base year appear formidable at first glance; however, most of these tasks can be completed very quickly. The organization of data for the South Coast Stock Planning Model requires a considerable amount of work. Half weekly sockeye, pink and chum escapement estimates have to be accumulated for the various stocks running in each year and marked with daily catch estimates for Fraser and Juan de Fuca net fisheries. Fortunately this task has been completed for 1975-82 sockeye runs, 1975-83 odd year pink runs and 1975-1983 chum runs. Further details on the various models are included in the following sections.

4.0 DATA ORGANIZATION FOR WEST COAST TROLL FISHERY

The two major data sources for the West Coast troll management model were the sales slip catch and effort database and the run size entering the Strait of Juan de Fuca derived from the South Coast management model (Gazey et al. MS1987). Figure 2 displays the overall data flow used as input to the West Coast Model.

In this section, calculations used to construct the corrected catch and effort summary are presented because the summary was central to all other analyses. The analyses that access the corrected catch and effort data (stock reconstruction and cohort analysis) are described in subsequent sections.

The catch and directed effort summary was formed by first approximating the week that fish were caught (and the required effort) from the week of sale given by the sales slip database. The resultant total effort in any week was then partitioned into the effort directed at each of the five salmon species based on an economic argument. These two steps (temporal adjustment of catch statistics and calculation of directed effort) are described below.

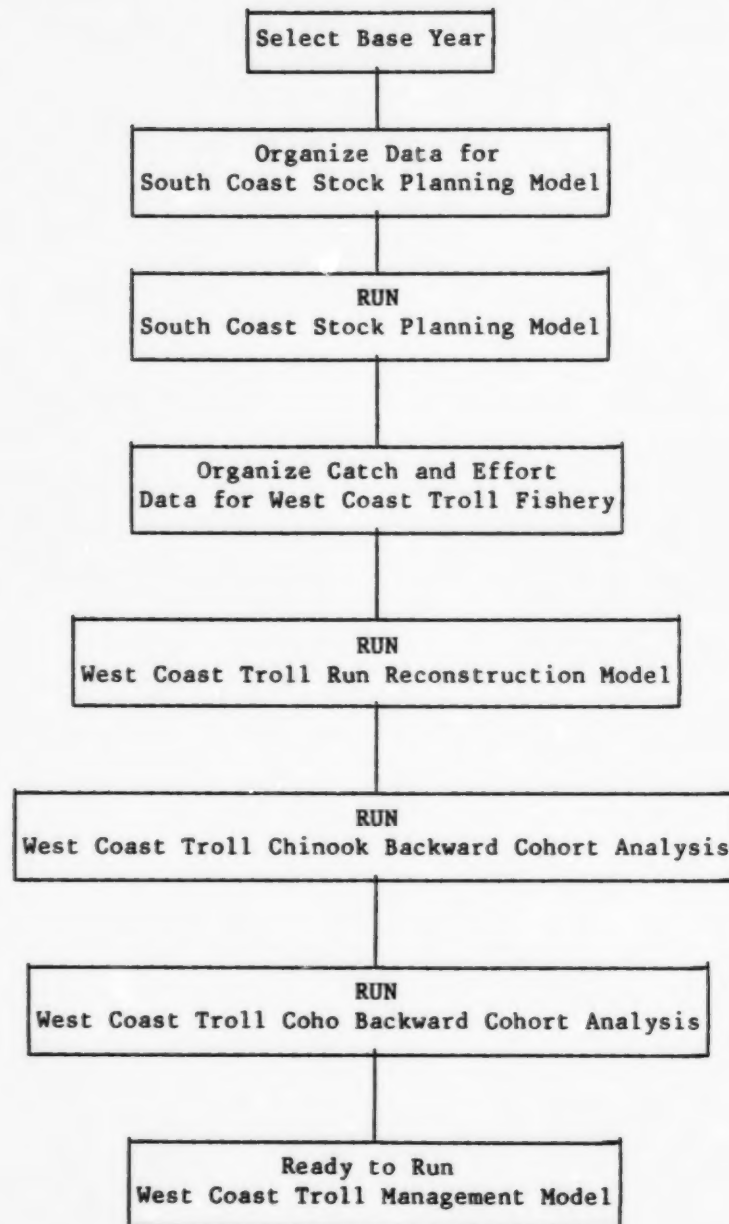


Figure 1. Sequence of tasks required to prepare a base year for the West Coast Troll Management Model.

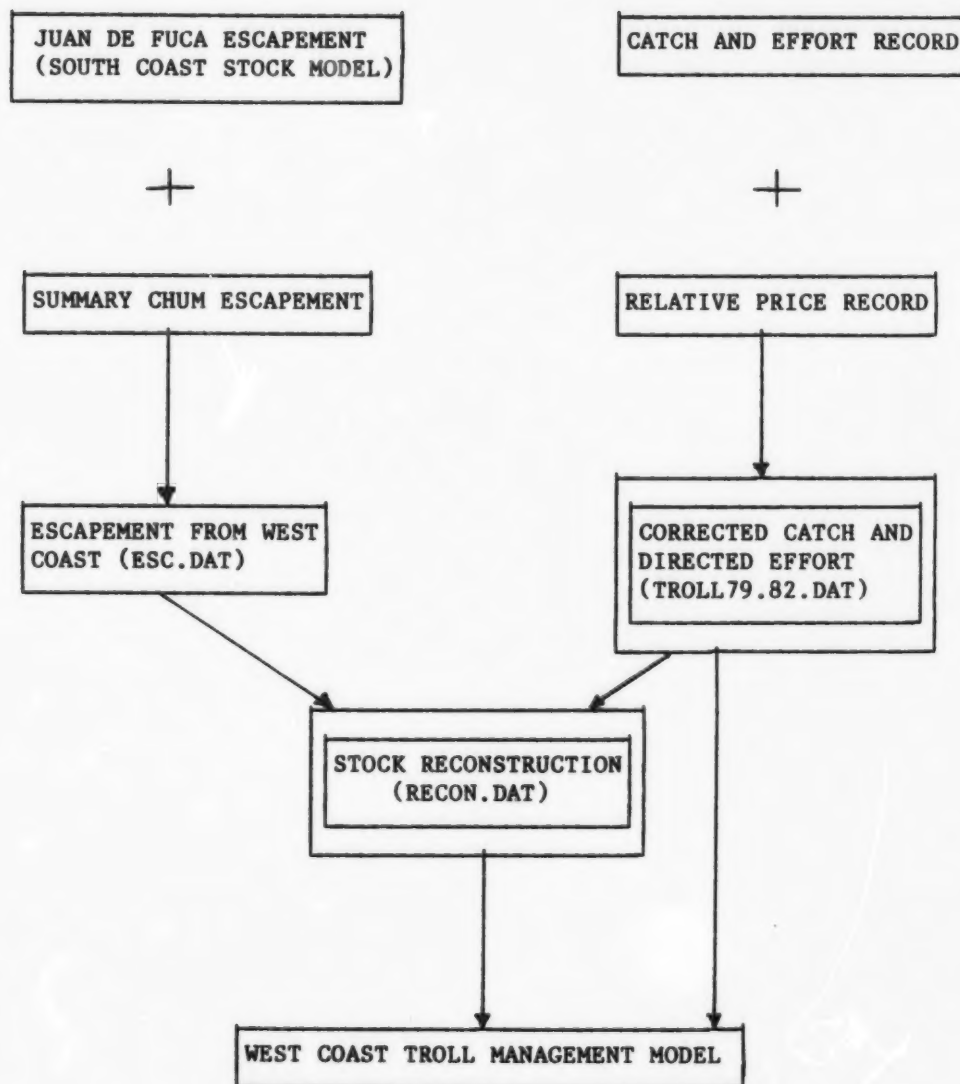


Figure 2. Data flow used in the West Coast troll management model. Double margins indicate the major data summaries read directly by the model.

Catch and effort statistics in the sales slip summary database are given by week for freezer trollers and non-freezer trollers (e.g., day boats). Since freezer trollers can operate for extended periods (i.e., 5-8 weeks) without landing their catch, this inclusion can distort the true catch record. Therefore, the proportion of annual catch taken and effort expended over any given week was assumed to be the proportion of catch and effort reported by non-freezer trollers over a two week period: half during the week of sale and half during the previous week. All catch and effort reported for the first week of the season or the first week of fishing following a closure was assumed to occur the same week. The catch and effort for any week was then calculated as the simple product of the proportion and the annual catch or effort obtained from all sources (i.e., freezer and non-freezer statistics).

The proportion of the effort directed at a particular species for any given week was then calculated, through the assumption that the West Coast troll fishery is a common resource with no one fisherman or group of fishermen able to control the price through restrictions on catch. In other words, the fishery will operate such that, on average, the value of the catch taken by a unit of effort will be equivalent for all species. Therefore, the measure of effort directed at a particular species during any given week is in proportion to the value of the catch, i.e.:

$$E_{ij} = E_i \frac{P_j C_{ij}}{\sum_j P_j C_{ij}}$$

where E_{ij} is the effort directed at species j during week i , E_i the weekly corrected effort described above, C_{ij} the weekly catch for species j , and P_j the relative value index for species j .

5.0 WEST COAST TROLL RUN RECONSTRUCTION MODEL

Gazey et al. (1987) produced half-weekly run size estimates of sockeye, pink and chum stocks entering the Strait of Juan de Fuca and Johnstone Strait (pink odd year stocks only) by stock reconstruction methods, for the purpose of obtaining harvest rates to be applied in the South Coast management model. The multiple stocks used by Gazey et al. were amalgamated into three stocks (1976-1985) for each species (see Table 2) with a one-week time resolution (two half-weeks were summed together). These weekly run size estimates were then taken to be escapement from the West Coast troll fishery.

Next, a very simple run reconstruction was conducted with a single fishery (i.e., West Coast troll) using the "escapement" estimates from the South Coast model and the catch calculated from the catch and effort summary file described above. Travel time through the West Coast troll fishery was assumed to be 1 week for sockeye, 2 weeks for pink and 2 weeks for chum salmon. Weekly harvest rates were calculated and divided by the directed effort (described above) to obtain the catchability coefficient.

6.0 WEST COAST TROLL BACKWARD COHORT ANALYSIS MODEL

A backward cohort analysis was used to reconstruct weekly chinook and coho populations in the West Coast troll fishery from estimated escapement, actual catch data and a finite set of parameters. The weekly population estimates were combined with weekly catch and effort data to estimate weekly catchability coefficients. These catchability coefficients provide the basis for predicting catch in a forward cohort analysis where population size and fishing effort can be altered (Argue et al. 1983).

Both chinook and coho backward cohort analysis models have the same structure, parameter requirements, interactive inputs, formulas and outputs (see Figure 3). The only noteworthy differences are that the chinook model includes four age groups (age 2 through 5) while the coho model only includes two age groups (age 2 and 3), and all parameter values are different.

7.0 WEST COAST TROLL MANAGEMENT MODEL

Now that the run reconstruction and backward cohort analysis models have been run for the necessary base years, fisheries managers can run the West Coast Troll Management Model to reproduce catch patterns for any base year.

The Management Model was developed as a series of discrete sub-models. A brief description of each sub-model name function and the execution sequence is shown in Figure 4. The model dynamics are focused on the prediction of directed effort (i.e., the fishing effort directed at catching a specific species of salmon). Most management actions affect the catch of a specific species by increasing or decreasing the fishing effort directed at that species. English et al. (1988) presents a complete description of each sub-model and the algorithms used to predict directed effort.

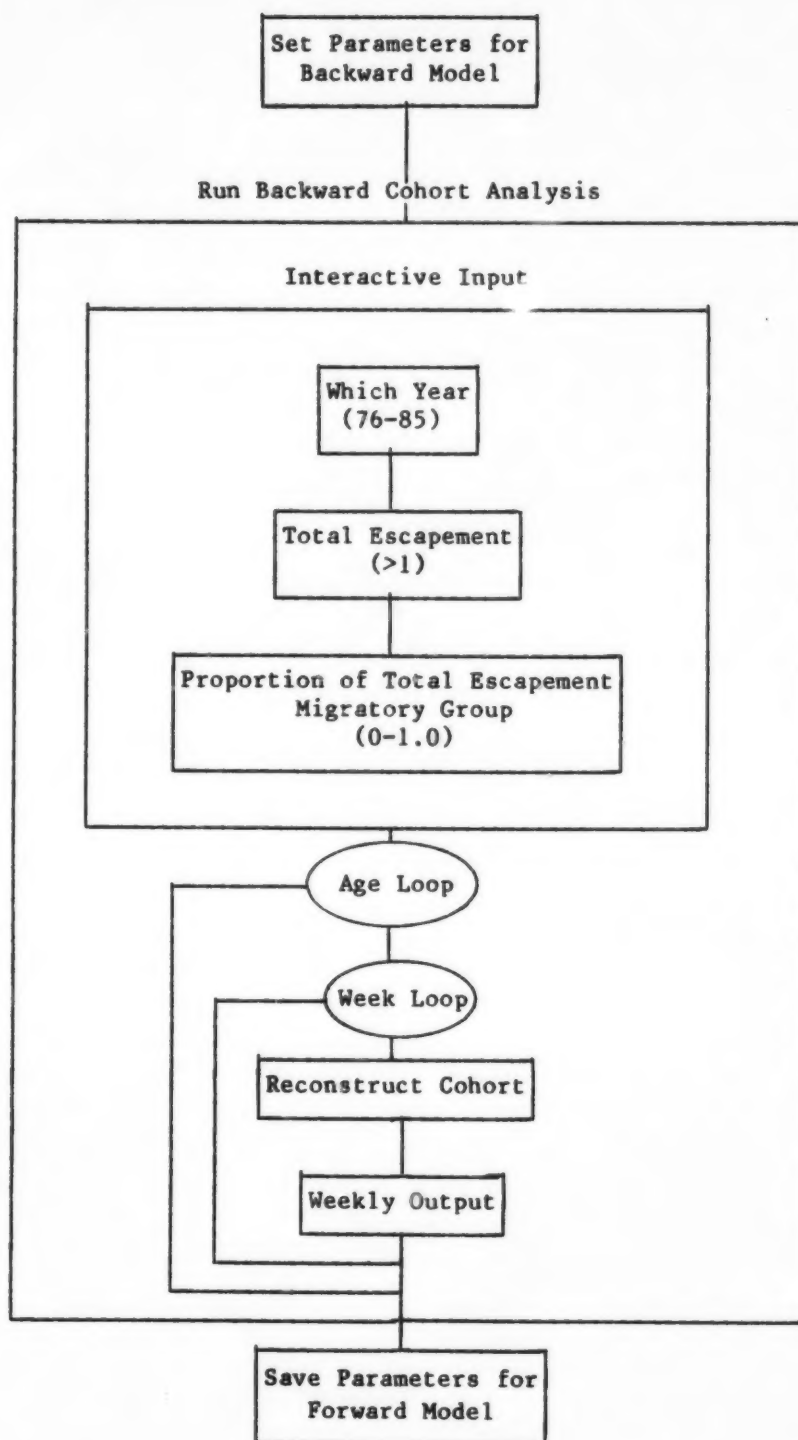


Figure 3. Structure of the West Coast Troll backward cohort analysis model.

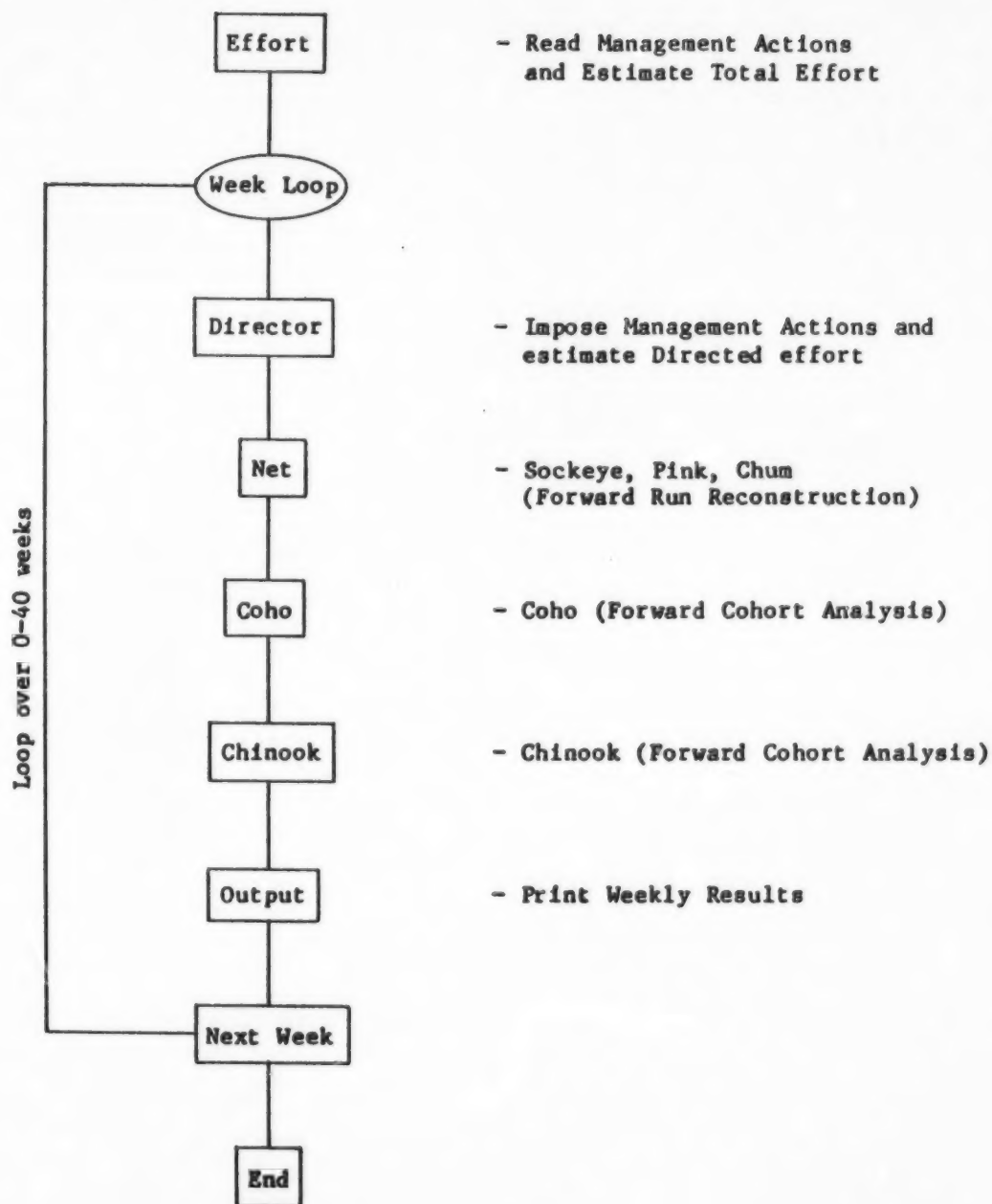


Figure 4. Structure of the West Coast Troll Management Model.

APPENDIX 7

WCVI SUPPLEMENTARY FLIGHTS, 1986

WCVI SUPPLEMENTARY FLIGHTS, 1986

Toward the end of week 8-1, increasing sockeye catches caused concern that the ceiling (allocation) might soon be reached. To improve the timeliness and accuracy of in-season sockeye catch estimation, several gear count flights were chartered to supplement the regularly scheduled tracker flights. Two observers in a Beaver or Cessna 185 flew the west coast from Statistical Area 124 (and later as the gear moved south, Area 121) westward to Cape Scott and around the top end of Vancouver Island. The counts made are presented below:

South Coast Division West Coast Overflights

Area	Aug 8	Aug 14	Aug 20	Aug 26
121	--	--	42	51
123	--	--	75	31
124	192	25 ^a	59	62
125	32	320	5	51
126	233	162	8	6
127	398	84	54	75
111	0	16	--	--
11	5	6	--	--
TOTALS	860	613	243	276

^aPartial count due to fog.

APPENDIX 8

ADDENDUM REGARDING FINAL CATCH FIGURES

ADDENDUM

Revisions to catches have been made since this report was drafted based on April 1987 catch estimates. The authors believe these revised catches do not alter the main conclusions presented in the body of this report. Provided below are the revised troll catch estimates from the salmon catch data base (Wong, 1983), accessed January 14, 1988, compared with the April 1987 values used in this report.

SALMON TROLL CATCHES

	West Coast Vancouver Island		Strait of Georgia	
	January 1988	April 1987	January 1988	April 1987
Chinook	342,063	337,918	43,899	43,690
Coho	2,156,833	2,025,400	181,419	182,657
Sockeye	1,834,124	1,770,020	280,923	271,244
Chum	364,544	360,647	2,160	5,240
Pink	200,997	198,093	3,551	3,349